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ESTIMATING THE COST OF ELECTRIC WIRING.

Whenever electrical contracting proves to be an unprofitable business in any given locality, a lack of co-operation on the part of local contractors is the rather customary explanation of this unfortunate condition. However, while the need of a closer and more general co-operation in the contracting field can hardly be emphasized too strongly, there are frequently other causes which contribute mightily toward making the profits from this vocation small. Of these causes there is none more prolific, it seems, than the absence of systematic and reliable methods of estimating the cost of prospective jobs of wiring. There are few men in the electrical business who would often undertake jobs of wiring at prices so low as to prohibit a reasonable profit on the work for the sole purpose of underbidding a competitor. On the contrary, it is a safe assertion that in nearly all instances when a contractor or wireman undertakes an installation of any considerable proportions he expects the work to prove reasonably profitable. If it subsequently develops that these anticipated profits are conspicuous because of their absence, the trouble can be traced to the method —or oftener to the lack of method—followed in estimating the cost of time and material necessary to complete the work.

Inability to estimate accurately the cost of any job of electrical construction is very commonly due to the absence of comprehensive memoranda of the cost of similar jobs previously done. Unless the contractor be a man of phenomenal memory and long experience in his line of work, the absence of such data as these must necessarily reduce estimating to a rather crude form of guessing. It may be remarked furthermore, that the fact that "the curbstone contractor," as a certain class of wiremen are sometimes dubbed, so often remains in that frequently berated class, is due largely to his failure to appreciate the correctness of the foregoing assertion.

In this connection, the remarks of Mr. Craighead, found on another page, are particularly interesting. The loose-leaf system which he recommends, lends itself admirably, it seems, to the keeping of the records so necessary to a successful prosecution of the contracting business. Wiring specifications and estimates drawn up in the manner recommended and filed for reference along with a statement of what the cost of the job was actually found to be, must always be of the greatest usefulness to the contractor. Some such system is indispensable in intelligent contracting.

INTRODUCING ELECTRIC POWER IN ESTABLISHED PLANTS.

The benefits of electric motor driving are so well appreciated now that in many new industrial plants no other method of operation is seriously considered. It is a well known fact that in some localities the sale of small steam and gas engines is decreasing because of the advance of the electric motor into practically every branch of manufacturing. One expects newly built factories within reach of cheap electric power to adopt the electric drive almost as a matter of course. The question is mainly between isolated plant and central-station service, and examples are becoming fewer where purely mechanical systems of operation are being selected. With respect to new plants, therefore, the situation is on the whole very satisfactory. The more difficult problem is unquestionably the application of the motor drive to existing mills and shops.

It is a question if enough capital has been made in the past of the ease with which industrial electrification can be carried forward in successive steps. A thorough investigation of the costs in an established factory will often show that it is profitable to discard the present steam or gas-engine equipment and substitute electric motors. The central-station power solicitor reaches this conclusion and then criticises the plant owner because he does not act upon it, even after the facts are acknowledged. This is a very important matter. If the attempt to secure the business fails here very little immediate good is accomplished. It is not enough to prove that the change is warranted on the money side, in dealing with conservative users of power, and the reason is often the very simple fact that the establishment lacks the ready money and sometimes even the credit with which to displace its old equipment.

Situations of this kind can only be met by the policy of submitting a substitute offer by which the proposed electrification may be begun on a small scale, or by some arrangement through the central station by which the cost of the new drive may be in part assumed at first by the company selling electrical energy, and later liquidated by the consumer in connection with his monthly bills. In meeting both these problems the highest kind of ability is required, and yet it is not beyond the capacity of any first-class power sales department to handle the matter efficiently. In connection with the policy of beginning electrification gradually, it is obviously more difficult to show a financial profit than where the complete installation is treated. Yet an attempt to do this must be made, if the owner will not stand for the purchase of the entire outfit needed to make the best showing, and if the practice of the power company discourages any measures by which the burden of installation expense may be lightened for the consumer. In this connection, the possibilities of the group drive come to the front in a helpful way. It has become the fashion in some circles to scoff at the group drive, and it is true that the whole tendency of the times is toward separate motors; but in facilitating a preliminary foothold in an old shop at a modest initial cost, this method deserves very careful consideration by the power solicitor.

If the first cost of a complete individual drive deters the manufacturer from taking the step, the central-station man may well see what can be done for him with one or a very few motors, assuming that the power company prefers to keep clear of the investment side. Each case must be treated on its merits, of course, but there are some striking points which ought not to be overlooked in fitting a few motors to a situation where initial cost is a controlling factor. As a rule machine shops, when shaft-driven, require for their operation less than 30 per cent of the power at which the individual tool is rated. Therefore, if the machines are classified properly and the line shaft is cut up into sections, of say 10 or 15 machines each, a motor of one-third the capacity of the sum of the full-load requirements of the different machines will do the work and give a high line-shaft efficiency. This is because, perhaps, not one-fifth of the time is a machine taking its full driving capacity, notwithstanding it may be in operation nine-tenths of the time, for the reason that part of the time is taken to set the piece of work up on the machine, part is consumed in finishing cuts, polishing, and other subnormal-output work. As the 15 machines in each group are never performing exactly the same operation together, the single motor required to drive the group gets the benefit of a diversity-factor or equalization which cuts down the motor cost to about one-half to one-third that of separate driving. The cost of wiring is also greatly simplified, and the expense of control and starting boxes cut down. It is not usually appreciated that the heavy starting demands of separate motors driving powerful tools tax the distribution system severely, compared with the possibilities of flywheel operation in connection with group drives. The main point, however, is that, while flexibility suffers somewhat in the group drive, the initial step toward a final complete electrification can easily and inexpensively be made in this way. It is generally true that a subdivision of departments if not of individual machines permits many of the benefits of separate driving to be realized, including the constant torque of the large motor as compared with the reciprocating motion of the engine, large decrease of power on overtime work, reliability of service, quick acceleration and consequent tendency toward increased output, reduced number of spare parts to be maintained in stock, use of less expensive belting and chain drives, avoidance of troubles with heavy gears, and reduction in the amount of skilled labor required to keep the plant in motion. If the condition of the shafting is carefully maintained on group drives, notably with respect to alinement and lubrication, some remarkably good records may frequently be made by the use of a few motors in place of the many which may be justified by the financial analysis, but which are avoided by the owner until experience with electricity on a smaller scale encourages him to make the complete change.

KNOB AND TUBE WIRING.

Concealed knob and tube work has been very widely used in the wiring of residences. The principal reasons for the popularity of this type of wiring are doubtless the fact that it is free from the unsightliness which sometimes attaches to open wiring, and the further fact that its relatively low cost usually appeals very strongly to the prospective patron of electric service. Without going into any discussion of the question as to whether some more substantial type of wiring should not often be used where knob and tube work is actually installed or why the inspection departments of one or two of the larger cities do not permit knob and tube wiring, it may be remarked that the low initial cost of wiring of this kind is largely due to the ease and speed with which it may be installed. As most wiremen know, comparatively little skill is required in the installation of work of this kind, except, of course, in the wiring of houses already built. These remarks concerning the simplicity of knob and tube wiring, however, are not to be taken as any suggestion that this is a class of work which may be done carelessly. When a job of concealed knob and tube wiring has been finished and the building completed, or boards and furniture restored to their normal condition, as the case may be, there is very little opportunity for any subsequent inspection of the wiring or for the casual discovery of any defects that may develop therein. It is highly important, therefore, that the wiring be done thoroughly and well at first.

In view of the very wide use of knob and tube wiring and the importance of its being properly done, Mr. Kirchgasser's notes on the subject which appear elsewhere in this issue must prove very timely and valuable. To some of the more experienced wiremen, to be sure, certain details into which these notes go might possibly appear trivial. On the contrary, a study of wiring practice reveals the fact that such detail is altogether necessary. Consider, for example, the simple matter of boring joists for insulating tubes. It is not unusual for these to be bored horizontally, or even for tubes to be installed with the head lower than the point. Cases have arisen, in fact, where electrical inspectors have been obliged to insist on having the tubes in such installations taped in position in order to make certain that they would not be dislodged by some vibration. The fact is that matters of this kind, instead of being trivial, are so important that more definite specifications in the printed rules of local inspection bureaus—or even in the National Code itself—relative to them would not be out of place. With reference to Code requirements concerning the kind of wiring under consideration, the question may be raised as to whether the recent elimination from the Code of the former specification requiring the use of screws for holding knobs in place was a wise procedure or not. A hammer, a careless wireman, and a porcelain knob are a bad combination—that is, bad for the knob. While under usual conditions building materials over which the conductors are carried in knob and tube work are fairly good insulators themselves, it is highly desirable that the wires be thoroughly and permanently insulated from these in every case. This means that extreme care and thoroughness should be exercised in the installation of the knobs and tubes.

THE ELECTRIC SIGN.

The electric sign has reached a stage where we may look for much more study along the line of adaptation for the purpose used. The design of signs, like that of so many articles which are put upon the market in large quantities, is too likely to degenerate into a practice of following the path of least resistance and utilizing something which has been used elsewhere, and is, perhaps, more particularly suited to some other purpose. Whether a sign should be continuous or flashing; whether the bulbs used should be clear or frosted or colored; whether different colors should be flashed on and off; whether the different colors should present the same or different messages; and whether the flashing sign should depict some motion or mechanical operation, are all matters which must be studied with reference to the subject and to the most appropriate impression which can be made upon the observer.

Not only is it necessary to first design a sign which is suitable for the use to which it is put, but it is highly necessary that maintenance should be properly looked after, if a good impression is to be continuously created. For instance, renewals of burnt-out lamps should be carefully attended to, as the appearance of a sign with broken letters or similar defects is usually an advertisement of the carelessness or incompetency of the owner and is not of a nature to attract business. The use of high-efficiency lamps is usually to be recommended, but if a sign is in such a position that it is not possible to make frequent renewals it may be more advantageous to use lamps of lower efficiency and have less liability of burn-outs.

The construction and maintenance of the electric sign are evidently matters that require the same efficient consideration which must be given to any other detail of a business in order to make it attain the highest commercial success. Careful attention to details, with proper adaptation of what is available to the purpose intended, will add greatly to the effectiveness and popularity and profit of the electric sign. The central-station manager should present these points clearly to the user of the electric sign and should aid him in securing a proper sign and in maintaining it in proper working order. The common arrangement of leaving maintenance in the hands of the central station is a good one, and the latter should see that its reputation in this matter does not suffer.

Meeting of New York Electrical Contractors.

The Electrical Contractors' Association of New York State, 100 strong, met in annual convention in New York City on January 16. Two sessions were held and reports of the secretary and treasurer showed 110 members and finances in good shape—better than last year. There was a long discussion over the relations of the contractors with the underwriters and a special committee was appointed to report on rates charged for inspection.

Relations between lighting companies and contractors are to be greatly improved along the lines of co-operation and better understanding as to rates for supplies and construction. J. F. Becker, chairman of the committee, reported better feeling all over the state. The attendance from the eight local organizations was thoroughly representative and enthusiastic and the meeting as a whole the best and most important one in results and good feeling ever held. The convention adjourned at 4 p. m. Tuesday to meet in Syracuse next year on the second Tuesday in January.

The following officers were elected: President, F. W. Newman, Albany; vice-president, H. Smith, Syracuse; secretary, George W. Russell, Jr., New York; treasurer, James R. Burns, Schenectady.

A committee, with James R. Strong as chairman and George Weiderman as secretary, had charge of the admirable local arrangements. Meetings were held in the well adapted building of the Trades Club, of which the New York local association is a member. An afternoon tea, theater party, automobile ride and smoker comprised the pleasant entertainments. There were over 150 guests in attendance, in addition to the very full membership, and while young men dominated there were present many old-time young-looking electrical men.

Northwestern Electric Show.

Arrangements for the third annual electric show of the Northwestern Electrical Show Association are progressing rapidly, and from all appearances this year's show will eclipse everything heretofore held in that city. A very interesting and instructive set of exhibits will be displayed showing the marvelous progress which is being made in the electrical field. The officers of the association are very enthusiastic over the results of their efforts to gather a representative and elaborate collection of exhibits. There will be a number of working exhibits, demonstrating the winding and construction of electric motors, the ventilation of buildings by the use of electric power, the operation of a telephone exchange, the chemical treatment of poles, the operation of a coal breaker, and many other industrial operations. Recitals will be given upon an electrically operated organ, and a demonstration of domestic utensils will be unusually complete. A large number of styles of electric vehicles will be exhibited, in addition to storage batteries and facilities for charging them.

The Minneapolis Commercial Club has offered prizes for exhibits of the electrical work of students, and in this connection exhibits will be shown from Iowa, Wisconsin, Montana, North Dakota and South Dakota, as well as from Minnesota.

A design has been prepared for use by Twin City merchants on their mail. The words "Electrical Exposition" are displayed prominently on the cover of a book, below which appears the legend "A Modern Education" with the place and dates of the show.

The exposition will be held in the National Guard Armory, Minneapolis, during the week from March 16 to 23.

Annual Meeting of Illuminating Engineering Society.

The annual meeting of the Illuminating Engineering Society was held at the Machinery Club, New York City, on Friday evening, January 12. There were about 100 present. Addresses were made by A. E. Kennelly, Walter Cook, I. C. Copley, A. C. Humphreys, Gano Dunn and others.

The following officers were elected: President, V. R. Lansingh; vice-president, Norman Macbeth; secretary, P. S. Millar; treasurer, W. J. Serrill; directors, C. J. Russell, A. J. Marshall and R. C. Ware

Cable Reduction Extended.

Negotiations entered into by the Postmaster General of Great Britain looking toward an extension of the cable service for plain-word cablegrams on which immediate delivery is not demanded, have been completed so far as France, Germany, Portugal and a large number of British colonies are concerned. The new system of reduced rates has already gone into effect. The French Telegram Cable Company extend half rates on deferred cable messages to dispatches passing between France and America.

Electric Vehicle Meeting.

The regular monthly meeting of the Electric Vehicle Association of America will be held at 29 West Thirty-ninth Street, New York City, on January 23, at 8 p. m. A paper will be presented by H. E. Pratt, of the Gould Storage Battery Company, entitled "The Storage Battery Car."

Electric Club Nominations.

The meeting of the Electric Club, Chicago, on January 17, was devoted to entertainment. The Committee on Nominations, which consisted of A. L. Millard, W. R. Bonham and R. S. Mitten, had been appointed at the previous meeting, and made its report. The nominations are as follows: President, A. A. Gray; vice-president, Perry R. Boole; secretary, William M. Connelly; treasurer, John R. Harmon; board of managers, J. R. Cravath, D. A. W. Roper, N. F. Obright, H. G. Hafner, J. H. Delany, in addition to above officers.

The ballot on a day of meeting proved the popularity of Wednesday, the present day of meeting. A motion was nevertheless made to amend the by-laws so as to make Thursday the meeting day, and the matter will come up for final action at the annual meeting.

C. A. S. Howlett, from Schenectady, N. Y., and J. Bigland, of Denver, Colo., were called upon for a few remarks.

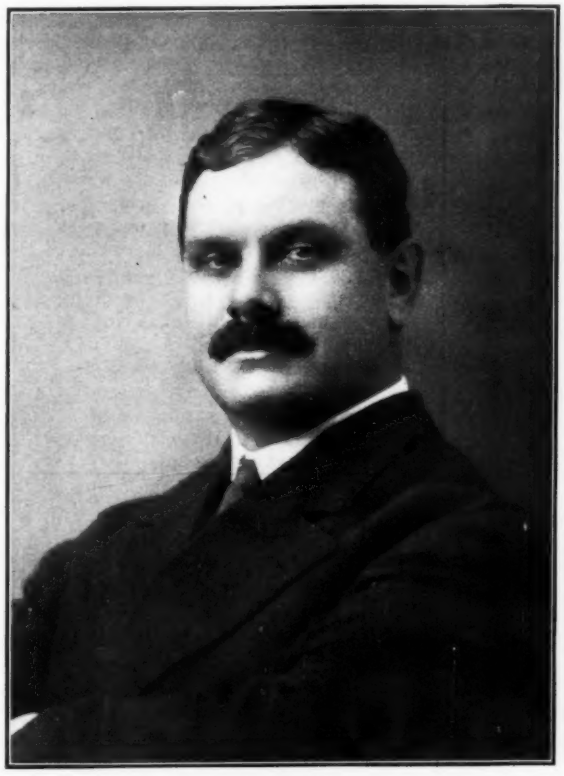
The Work of the Bureau of Standards.

At the meeting of the Electric Club, Chicago, on January 10, M. G. Lloyd made an address on "The Work of the Bureau of Standards." The speaker outlined the origin, scope and activities of the Bureau and made some detailed statements showing the relation of its work to business and manufacturing concerns.

The Bureau has custody of the standards for all kinds of measurements which have been legalized in this country, but its work is not confined to making comparisons of working standards with these ultimate standards. Many researches are carried on by the Bureau to determine the properties of materials, physical constants, improved methods of making measurements etc. An example of this work is the improved wire table which has recently been adopted by the American Institute of Electrical Engineers. Researches are now under way dealing with the electrolytic corrosion of reinforced concrete, and many other matters of wide practical interest. Publications are issued by the Bureau containing accounts of the research work carried on, circulars of information, standard specifications for incandescent lamps, transformers, etc. A great deal of testing of materials and of instruments is carried on, especially for other departments of the Government; paper for the Government Printing Office and incandescent lamps being noted as illustrations. Co-operation with city sealers of weights and measures in compelling the use of accurate apparatus is another feature.

C. Loomis Allen.

Announcement is made of the reorganization, financing and rehabilitation of the properties controlled by the Newport News & Old Point Railway & Electric Company, a Hampton, Virginia, corporation consisting of railway, gas, electric light and ice interests. The companies include the first named organization, the Citizens Railway, Light & Power Company, the Hampton Roads Traction Company, Newport News Gas Company, and the Distilled Ice Company. At a meeting of the board of directors held at Newport News, Va., on January 12, C. Loomis Allen, of Syracuse, N. Y., was elected president of the board, and Edward F. Peck, of Schenectady, N. Y., was elected vice-president. These two gentlemen have recently organized the firm of Allen & Peck, Inc., for the purpose of reorganizing, financing and managing public utility properties. A syndicate, known as the Newport News Syndicate, composed of leading financial interests in New York and Baltimore, and Messrs. Allen and Peck and associates will reorganize, finance and rehabilitate the Virginia properties.



C. Loomis Allen,
President of the Newport News & Old Point Railway & Electric Company.

C. Loomis Allen has been engaged in the railway business for twenty-one years. He was educated at Syracuse and Alfred Universities, and after graduation entered the employ of the Norfolk & Western Railway Company, where he remained until 1892. At this time he became a member of the firm of Mather & Allen, and engaged in civil engineering practice in the city of Syracuse. During the period up to 1895 this firm electrified all the horse-car lines in Syracuse, and in 1895 Mr. Allen was appointed civil engineer of the consolidated electric railway lines in Syracuse in charge of the reconstruction of all track and overhead. From this time until 1899 he remained with the Syracuse Rapid Transit Company as engineer, assistant general manager and as general manager. In 1899 Mr. Allen became general manager of the Lorain Street Railway Company, of Lorain, Ohio.

In 1901 he went to Utica, N. Y., as engineer of the Utica & Mohawk Valley Railway Company, and in 1907 was appointed general manager of this organization. In 1906 Mr. Allen was elected to the following positions which he now holds, namely, vice-president and general manager of the Syracuse Rapid Transit Railway Company, Syracuse, N. Y.; Utica & Mohawk Valley Railway Company, Utica, N. Y.; Oneida Railway Company, Utica, N. Y.; Rome City Street Railway, Rome, N. Y.

In 1909 Mr. Allen formed a syndicate and took over the Syracuse & Suburban Railroad Company, of Syracuse, N. Y., of which he has since been president, and in 1910 he was also elected a vice-president of the New York State Railways Company, of Rochester, N. Y.

Edward F. Peck, who is associated with Mr. Allen in the new organization, is one of the best known and ablest public-utility managers in the country. He is at present general manager of the Schenectady Railway Company.

Both Mr. Allen and Mr. Peck have taken a leading part in the state and national electric light and railway associations, and both have held prominent positions as members of committees and as officers of these organizations. Both men have an unbounded faith in the future of public utilities as an investment feature and as an honorable vocation, and under their direction a very successful development of these properties may be anticipated.

While the firm of Allen & Peck, Inc., will directly administer the affairs of the interests represented by the Newport News & Old Point Railway & Electric Company, it is stated that the work of the corporation will not require the resignation of either Mr. Allen or Mr. Peck from the New York state interests with which they have been so long identified.

Commonwealth Edison Company Purchases Large Chicago Office Building.

The Commonwealth Edison Company, of Chicago, has purchased the twenty-story office building and the lease on the ground at the northeast corner of Adams and Clark streets, Chicago. The Continental & Commercial National Bank disposed of the property, which has ground dimensions of 190 by 181 feet, for $4,667,932, of which $1,000,000 has been paid in cash, $1,800,000 represents an outstanding bond issue that has been assumed by the Edison Company, and the balance is to be paid in several yearly installments. The Continental & Commerical is the largest bank west of New York City. It will continue to occupy the building a few years until its new $7,000,000 structure is completed on the block bounded by Adams, La Salle and Quincy Streets and Fifth Avenue.

The old Edison Building at 139 (old number) Adams Street has been the home of the Commonwealth Edison Company and its predecessors since the beginnings of the central-station business in Chicago during the eighties. This building was long ago outgrown. It has been remodeled several times to suit the growing needs of the company, but its entire six floors are unequal to the office needs of the various departments. Several of the departments have been accommodated in both the adjoining buildings and in the company's Market Street building.

When possession of its newly acquired building is obtained by the Commonwealth Edison Company, it will remodel the structure to suits its needs. It is believed that the building will become the headquarters, not only of the Edison Company, but also of many other public-service companies operating in and near Chicago.

Idaho Cedarmen's Meeting.

The annual meeting of the Idaho Cedarmen's Association was held in Spokane, Wash., on January 8. In the absence of President Lindsley, G. C. Davis was elected temporary chairman.

The retiring officers, C. P. Lindsley, president, and H. C. Culver, secretary-treasurer, were unanimously re-elected.

A resolution was passed appointing a committee to prepare a set of by-laws for the Association, and H. C. Culver, G. E. Merrill and E. A. Lindsley were appointed for this purpose. Special instruction was given the committee that a provision for the appointing of official inspectors to settle disputes between customers and the members of the Association be incorporated in these by-laws.

A committee consisting of Neil Burrell, M. P. Flannery and W. M. Leavitt was appointed to bring before the railroads and the Master Car Builders' Association a complaint relative to the size and number of car stakes required by the M. C. B. rules. It is the feeling of the members of the Association that the present requirements are more stringent than necessary, both as to the number and size of the car stakes and the wire required to hold the loads.

The report of the Publicity Committee was read and accepted, and they were instructed to continue their efforts. It is the intention of the Association to co-operate with the Government in making tests as to the strength of the various species of cedar used for pole purposes, and the committee was instructed to give the Government every assistance possible.

In the evening a banquet was held at Davenport's, followed by a theater party. Those present at the meeting were as follows: Neil Burrell, Valentine-Clark Company; M. P. Flannery, B. J. Carney & Company; H. C. Culver, Sand Point Lumber & Pole Company; G. C. Davis, Humbird Lumber Company; W. M. Leavitt, National Pole Company; G. E. Merrill, Pacific Fir Company; E. A. Lindsley, R. L. Bayne, The Lindsley Brothers Company; L. D. McFarland, Northern Mercantile Company; Robert Jones, Lost Creek Cedar Company.

Meeting of the Telephone Society of New York.

The 133d meeting of the Telephone Society of New York will be held at 25 West Thirty-ninth Street, on Wednesday evening, January 24. There will be short papers illustrated by stereopticon views on "Recent Developments in Down-State Commercial Work." The speakers will be J. R. Pollock, H. W. Drake, W. F. Baker, H. G Kerr, A. D. Welch and R. S. Scarburgh.

Oklahoma Engineering Society.

The Oklahoma Engineering Society, at its annual meeting last week, elected the following officers for the coming year: President, D. E. Colby, Chickasha; secretary, W. E. Moore, Oklahoma City; first vice-president, C. M. Lawrence, Holdenville; second vice-president, W. L. Benham, Oklahoma City; third vice-president, T. D. Brown, Shawnee.

The program included the following papers: "The Comparative Economy of Burning Coal and Oil Under Steam Boilers," R. E. Chandler and R. L. Jones, Stillwater; "Lessons from the Austin-Dam Failures," H. V. Hinckley, Oklahoma City; "Economical Designing of Water Distribution Systems," F. D. Brown, Shawnee; "Electric Treatment of Sewage," L. G. Lautzenhiser.

Underground Wires for Montgomery.

All overhead wires in the business district of Montgomery, Ala., are to be placed underground. The change involves four electric lighting companies, two telegraph companies and one telephone company. Specifications for the change have been drawn up by the city electrician without conferring with the companies affected. A conference has consequently been arranged between the City Commission and representatives of the various companies for February 1, at which time it is expected to settle all differences.

The work will cost each of the companies about $90,000.

Western Union Charter Attacked.

Steps to have the charter of the Western Union Telegraph Company, in Wisconsin forfeited have been taken by Ralph W. Jackman, who requested Secretary of State Frear to act in the matter. Frear has asked Attorney General Bancroft for an opinion as to what action shall be taken.

A statute provides that all corporations licensed to do business in Wisconsin shall lose their charters when they remove from the state courts to the federal courts causes of action arising in the State. Jackman alleges that the company has removed to the federal court several suits started against it by Wisconsin parties.

January Meeting of Car Lighting Club.

The Car Lighting Club will meet at the Kuntz-Remmler Restaurant, Chicago, on Wednesday evening, January 24, at 8 p. m. Dinner will be held at 6:30 p. m. The subject of the meeting is "Troubles and How to Shoot Them." The discussion will be led by Messrs. Colegrove and Meyers.

Minneapolis Electric Meeting.

About 150 men turned out to attend the January meeting of the Minneapolis Electric Club, held on January 8 in the new assembly room provided by the Minneapolis General Electric Company, on the fifth floor of its general office building. President F. G. Dustin appointed a committee to arrange for the annual banquet of the Club to be held during the month of February. This committee was given power to act and consists of Chairman H. J. Gille, Charles W. Arrick, Emil Anderson, Frank O. Wallene and Maurice T. Moss. Mr. Gille was designated also to serve as toastmaster. Covers are usually laid for about 300 at this annual affair.

Mr. Martin, of the Mac Martin Advertising Company, of Minneapolis, gave a very interesting talk on co-operation in advertising. His discourse was very instructive as he went into the fundamentals of good advertising and lead up to its application to the "Great Electrical Idea," as he termed it. He gave the local papers much credit for their active interest in securing such high-class and educational electrical advertising.

T. A. Cressey, an expert connected with the Chicago office of the Electric Storage Battery Company, made a special trip to Minneapolis to present before the Club an interesting paper on "Commercial and Pleasure Electric Vehicles." The paper pointed out the great advantages of electric-vehicle transportation for urban delivery, such as promptness, speed, cleanliness, cheapness, etc. He said the great thing in favor of the electric was, that, due to the minimum repairs necessary, it was practically an all-the-year-round proposition and gave the greatest actual hours of service and miles per year.

A large representation of electric-vehicle men from the local agencies was present; many of whom took active part in the discussion.

R. W. Clark, of the Elecrical Exposition to be held in Minneapolis March 16-23, was called upon to speak of the progress made to date. The members of the Club are much interested in this event and were greatly pleased when Mr. Clark told the meeting that matters were further along at this time, over two months in advance of the date of the show, than when last event opened. This gives some idea of what a treat is in store for the public. He stated that the electric-vehicle and battery exhibit will be the biggest ever, seventeen spaces having been reserved for these displays. He also spoke with enthusiasm of the elaborate lighting and decorative effects planned for the coming exposition.

Power Requirements in Furniture Factories.

A Study of Advantages of Electric Drive—Opportunities for the Sale of Power—Motor Requirements and Characteristics—Power Requirements—Power Data of Typical Installations.

Woodworking plants include sawmills, planing mills, piano factories, sash and door works, chair works, casket works, furniture factories, etc., each using machines adapted to its own characteristic conditions, and all requiring some form of driving power. While, of course, there are certain general conditions which are common to all, considered from the standpoint of the power engineer there are many features, peculiar to each branch of the industry that are worthy of individual solution. This article, therefore, deals only with furniture factories.

Electric motor drive for furniture factories possesses many advantages and is being rapidly adopted. It has been demonstrated under the severest service conditions that the electric motor renders possible the most economical approach to the direct application at the machine of the total initial power developed. Also, the better lighting and ventilation, the greater freedom from dust and lessened danger of physical injury, resulting from the removal of belts and shafting, have been found by experience to increase the productive efficiency of the employee. Electric drive minimizes the danger of accidents and delays, and by means of suitably located remote-control switches make it possible to shut down the entire factory instantly in case of emergency.

An important feature of individual motor drive is the ability to operate any group of machines or any separate machine overtime or at unusual hours without putting the whole plant into operation. This feature is of especial importance when the current is obtained from an outside source as in that case the cost of running any machine stops when the machine does.

Considered from the central-station standpoint, all furniture factories offer opportunities for profitable business. In the large factories, due to the availability of excessively large quantities of waste fuel produced in manufacturing, central-station power cannot, save in very exceptional cases be made attractive. However, there is an excellent field for overtime service, and for supplying power for extra machines which are constantly being added in all progressive plants. In Grand Rapids, Mich., one of the great furniture centers of the country, the Grand Rapids-Muskegon Power Company is deriving an excellent revenue from this class of business. The factories coming under this classification however, are few and there are left a great number of plants that can economically purchase current for all their requirements, generating steam for heating and dry kilns from the refuse. By intelligent soliciting on the part of central-station men the number of factories coming under this latter classification can be considerably increased.

In soliciting the adoption of electric drive for furniture factories a great proportion of success depends upon the attitude on the part of the central-station power solicitor to correctly analyze existing plant-operating expenses and fixed charges. Ability to do this readily and correctly will go far to demonstrate definitely and convincingly to a prospect the flaws and waste and general field for improvement in his power layout.

One of the important arguments to be remembered by the power solicitor is the marked reduction in fire risk where central-station power is used. If power is obtained from an adjacent steam plant the fire risk is great and insurance rates correspondingly high. Mechanical drive necessitates either the dangerous proximity of the boiler room or heavy losses in long steam mains or rope transmission. If central-station power is used, all danger from adjoining power plant is removed; in any case, electric drive not only does away with the inflamable dust inevitably carried into the engine room by the large belt, but also makes possible the complete isolation of engine and boiler either by means of solid fireproof walls or by their installation in a separate building. The elimination of heavy line shafts greatly reduces the danger of fire from overheated journal boxes or from spontaneous combustion of accumulated oily waste or shavings. It should be remembered that the rate charged by insurance companies, especially where steam boilers are in close proximity to the working machines is exceedingly high, and that by installing complete electrical equipment in a modern fireproof building the annual premiums may be reduced from perhaps 7 or 8 per cent to three-quarters or one per cent. In many cases the savings in premiums will go far in making up for the original cost of the electric installation.

Other points to be borne in mind by the solicitor are: electric drive permits uninterrupted operation of tool and the attainment of high shop "time factor"; improves quality of product, as good product from woodworking machinery is largely dependent upon a drive capable of transmitting even and constant torque to the cutting tool; economizes unit cost of product, either by increasing product with a given equipment and personnel, or by direct economies in those charges debited exclusively to power; eliminates shafting and belting, allowing better placing of driven machines and reducing to a minimum the dissemination of sawdust and flying particles; permits the maximum return from those machines whose productive capacity is largely dependent upon the proper maintenance of speed and power, etc.

Group Versus Individual Drive.

The choice of either individual or group drive depends entirely upon local conditions, service requirements, etc. In shops requiring any considerable amount of bench work or where few standard parts are produced in quantity the best solution is found in a combination of these two methods. Where single machines are but rarely used and also where a reasonably constant load is anticipated the individual drive is advisable. On the other hand, where the probability of all the machines being loaded at the same time is small and yet, where frequent service is required of each, it is often desirable to group a number of machines and belt to a short line shaft driven by one motor. The capacity of this motor may often safely be not more than half the aggregate ratings of the machines in the group.

Of course, the relative values of group and individual drive must be determined in every instance by a careful analysis of the requirements of the installation, and while there are many successful examples of economical group drive, it is now the concensus of competent opinion that in a large majority of cases the highest efficiency, both for the machinery to be driven and for the electrical equipment, can best be obtained by the application of a separate motor to each unit.

There are other conditions that have an important bearing on the selection of drive for furniture factories that should be given due consideration. In modern establishments, high productive capacity will hinge largely upon the convenience and rapidity with which work may be handled. Therefore, costly high-speed tool equipment may fail to realize possibilities unless

the machines be installed with entire independence of the usual fixed line-shaft conditions. In shops where productive machines are widely separated, one from another, or where occasional machines must be reached by long lines of shafting, individual drive is vastly more economical and generally preferable. Also, if metered-power costs are to be low, it is axiomatic that motors be operated so as to give a high running load-factor, that is, the input should approach full-load values during any period of time the motor is in circuit. This condition is manifestly difficult to attain except with individual drive, where the power may be shut down instantly with cessation of productive work.

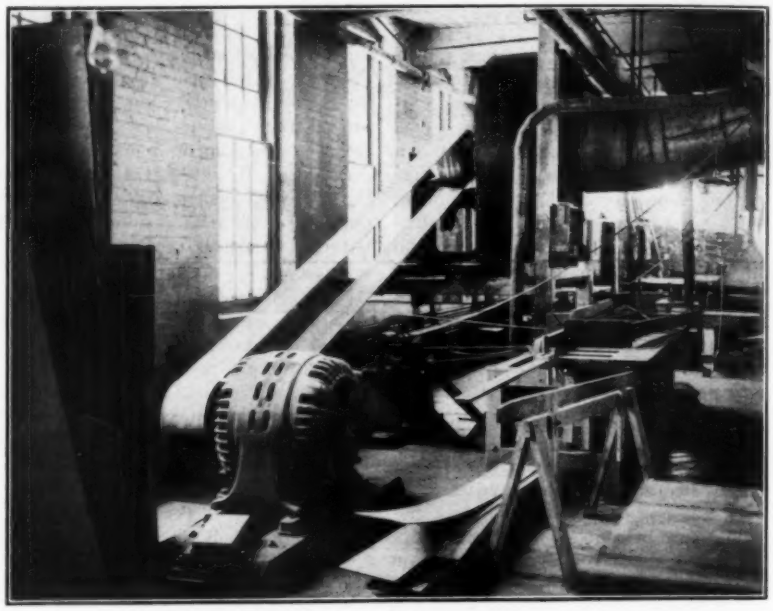
On the other hand, group drive may be preferable where a relatively small amount of power is to be transmitted a short distance, as it possesses the advantage in this case of simplicity and low first cost. Group drive may also be preferable where old tools are not of sufficient value to warrant the capital expenditure required to supply individual motors, or where the power required by each tool is individually small. Also, where power rates are low and the saving in capital investment for the motor and local equipment might overbalance the higher operative economies usually attendant where each driven machine is a unit in itself.

Selection of Motors.

The selection of the proper motors for furniture-factory drive is of the utmost importance and should be given due consideration by power engineers. Some interesting data in this connection was given in a paper presented some time ago by Charles H. Scott of the General Electric Company before the Michigan Electric Association from which the following is taken. If only direct-current supply is available, motors should be compound wound or of the interpole variety, since it is absolutely essential that the motors be capable of resisting the inherently excessive peaks which are apt to occur during the all-day load of the great proportion of woodworking machinery. Direct-current motors should be totally inclosed, except in those special cases where the driving machines are ceiling-suspended away from shavings and sawdust or located in a separately partitioned room, in such a manner as to eliminate fire risk.

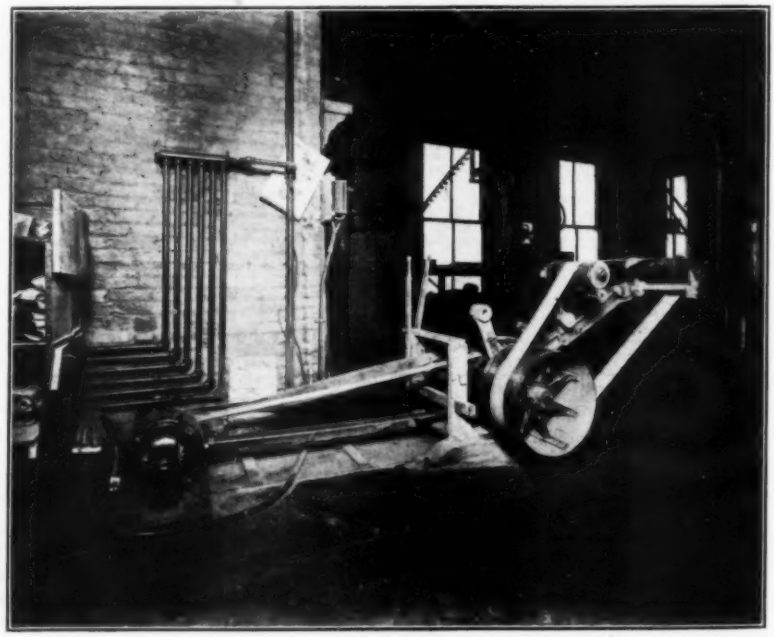
Large motors should be artificially ventilated and supplied with piping to and from outlet openings (1.5 cubic feet of air per minute per horsepower is usually sufficient). All controlling appliances of whatever nature, if exposed to sawdust and shavings should be ordered totally inclosed.

Where alternating-current supply is available, the polyphase induction motor with high-resistance squirrel-cage rotor should be specified, since the high-resistance rotor permits quick and frequent acceleration and provides the heavy starting torque requisite to overcome the inherently great inertia of woodworking machines.



Induction Motor Driving Blower—Wilmarth Plant.

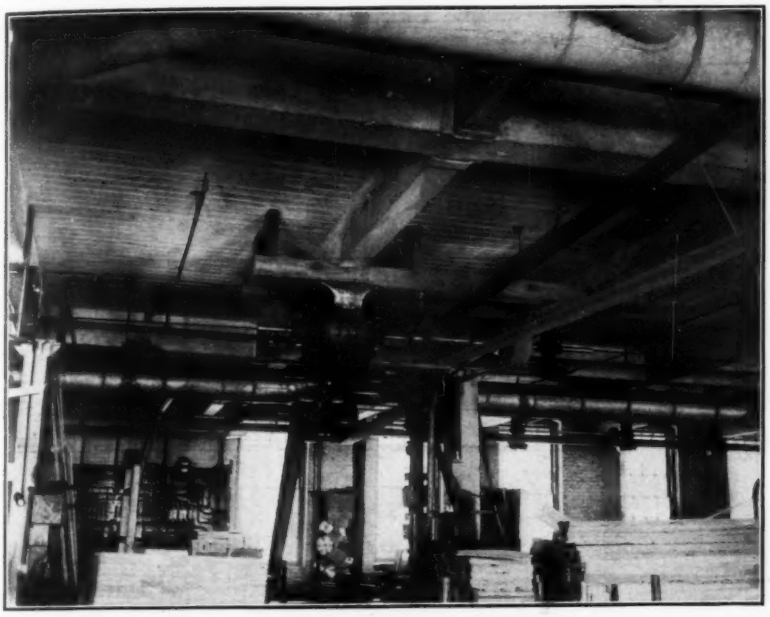
The type of alternating-current polyphase motors with polar-wound rotor and internal starting resistance, while possessing admirable torque and starting current characteristics, is not generally recommended for woodworking machines since sawdust almost invariably may be expected to collect on the starting resistance. In a few cases where variable speed with electrical control is desired, polar-wound internal-resistance rotors with collector rings and external resistances may be used. If this type of motor is desired, specifications should call for inclosed collector rings.



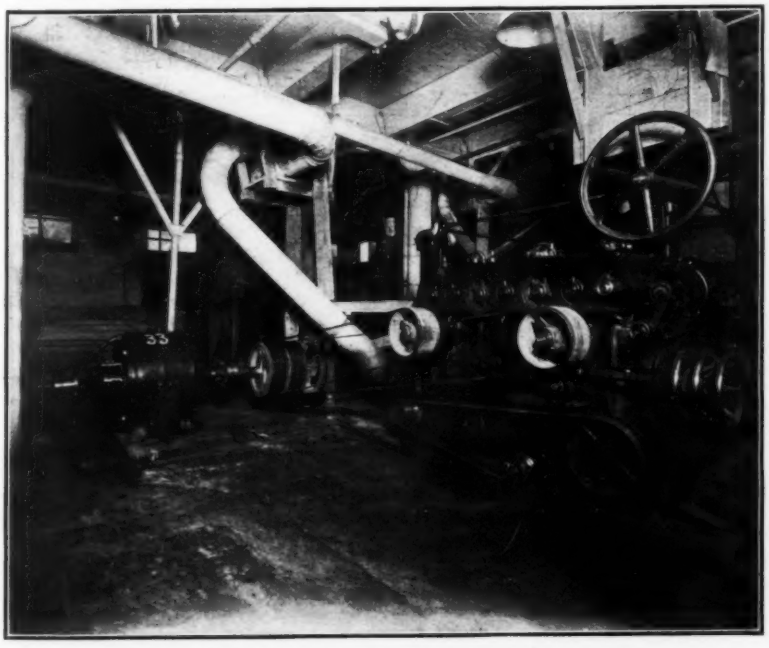
Direct-Current Motor Driving Sander—Hafner Plant.

Induction motors should preferably

be wound for moderate rather than slow speed, since, in addition to the decreased size and cost, the power-factor and efficiency of the moderate-speed motor is better than that of the slow-speed type. Also three-phase motors have better power-factor than two-phase and the system is preferable as less copper is required for conductors.



Induction Motor Driving Two Line Shafts—Wilmarth Plant.



Direct-Current Motor Connected to Sticker and Blower—Hafner Plant.

In the use of alternating-current motors care should be taken not to go to extremes in over-motoring, since with belts on the loose pulleys or the machine under light load the power-factor of the motor may be exceedingly low.

In general the use of alternating-current for furniture factories is to be recommended, as the requirements are ordinarily for constant speed and the three-phase type with high-resistance squirrel-cage rotor is admirably suited, due to the absence of commutator and the trouble and danger resultant therefrom where dust and inflammable material are present.

Since direct-current motors must be inclosed, their ratings for such operation must be sensibly diminished and larger machines are therefore demanded. In those few cases where variable speed is desired for operating the feed, alternating-current motors may be used of either the adjustable or multi-speed type. Woodworking plants are usually situated in the outskirts of the city, where the central station ordinarily supplies alternating current. The problem therefore, of supplying breakdown service is much simplified.

Owing to the high speed and light moving parts of woodworking machines and the frequent violent application of the load, it is desirable to use belt drive rather than gears or chains, especially as the speed of the driven pulley is usually too high to permit of other than direct or belted connection. The direct drive is coming into vogue in many modern furniture factories and is giving excellent results where the motor has sufficiently generous rating to accelerate rapidly and to withstand overloads. As the average depreciation of belting averages thirty-six per cent per year, it is important to reduce this waste and furthermore do away with any source of slippage between the driving unit and the working pulley.

In the installation of motors in furniture factories, if belts are used, it is strongly recommended that the same do not run vertically or have so decided a vertical component as to minimize the arc of contact on the driving pulley and at the same time prevent the use of the belt-tension adjustment on the motor base. Motors may often be conveniently located in an inverted position beneath the floor bearing the machine. If this method is adopted the belt between the motor and the machine should be boxed in and the drive arranged, as above stated, at a sufficient angle to be able to make use of the belt-tightener arrangement. There is a wide opportunity for the solicitor or power engineer to use his ingenuity in the layout and novel methods of drive for furniture factories.

One of the most difficult loads for the central station to handle is that of the large exhaust blowers which are used to exhaust the refuse from the machines. Depending upon the size of the shop, one of these blowers may take from 20 to 150 horsepower, and the load is naturally constant throughout the working hours of the plant, therefore, the resultant bill if central-station energy is used, is liable to be a serious impediment to the customer's adoption of motor drive.

In the plant of the Hafner Furniture Company, described more fully later, an innovation was used which promises amelioration of the difficulty dis-

cussed. In the installation in question only one small pipe is used, leading from each individual machine direct to a special cyclone dust and shaving separator, a small direct-driven blower being installed on each machine. The important fact to be noted is that under ordinary conditions not more than two machines in any special group are in use at the same time.

Power Requirements.

The power required to drive woodworking machinery varies widely according to the hardness and relative humidity of the wood used, the speed and depth of cut, the physical condition of the knives, saw teeth or other cutting tools. New and stiff machines, such as triple-drum sanders may take considerable more power at first than after a few weeks' limbering up, and dull or wrongly adjusted knives may result in a drain of 200 to 300 per cent on the power source over what would be required if the machine were in good order.

Particular care should be taken in recommending motors for larger planers, matchers, surfacers, band resaws, etc., where a wide variety may exist between the classes of lumber re-manufactured and the feed and speed used. With light machines, such as combination saws, jointers, tenoning machines, column and drum sanders, etc., the general character of the work and margin of power usually allowed by manufacturers in specifying horsepower to drive minimize to some extent the danger of under-motoring.

The load on a woodworking machine is, under most conditions, of an intermittent character, and the driving motor may often be rated at its temporary overload capacity, since the rapidity of feed and the consequent quick completion of cut allows frequent intervals of rest before another piece of wood can be fed in or made ready.

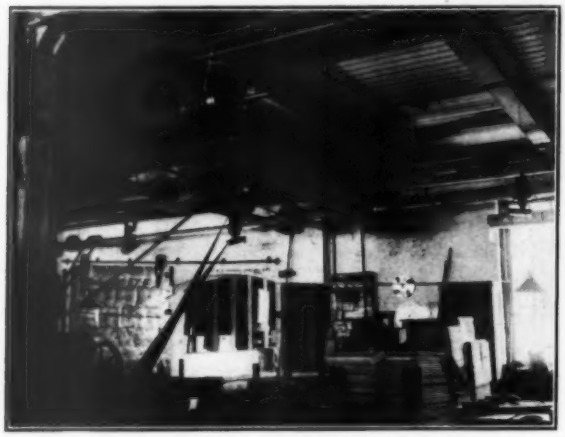
Electric Glue Pots.

It has been authoritatively stated that more than $4,000,000 is paid every year by manufacturers in this country for glue. It is also asserted that approximately one-half of the glue purchased is wasted. Some of this waste is unavoidable, but much of it can be prevented. A great deal of glue is spoiled through overheating. It is well recognized that the proper temperature for melting glue lies somewhere in the neighborhood of 140 degrees, Fahrenheit. It is also known that if the temperature of glue is allowed to exceed 160 degrees its strength will be greatly impaired. Electrical methods of glue heating are, when properly applied, ideal. The ease with which the heat can be controlled, the evenness of the temperature afforded, the readiness with which electricity for glue pot or heater operation can be conducted to any part of the factory and its economy are all convincing recommendations for the electrically heated appliances.

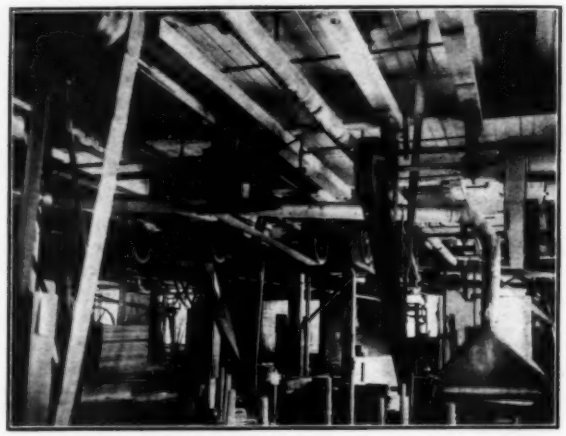
However, in several plants visited electric glue pots and cookers had been tried with indifferent success. The principal objection seemed to be the slowness in obtaining the proper heat for the glue. This objection is particularly annoying in the morning when perhaps the work of an entire department is delayed pending the heating of the glue to a workable temperature. If this slowness in heating is inherent in all electrical glue heaters the installation of a time switch in connection with the heaters would insure current being turned on sufficiently early to have the glue at the proper temperature when work has started in the morning.

There are available, however, electrical glue heaters of such a design that, it is believed, the installation of time switches would be unnecessary. These are of the immersion type, in which the heating element is submerged in the liquid to be heated. Obviously this is the most efficient type of heater for liquids, as all of the heat developed must be imparted to the liquid. None can be lost by direct radiation from the heater. Electric heating elements of the immersion type are also available to fit any size vessel. By means of these steam and gas heaters can be converted into electric with a minimum expense.

These heaters are all regularly provided with three-heat switches. As soon as the glue is melted the current can be adjusted so that just sufficient is used to keep the glue at the proper temperature. As an example of the relative current consumption the following figures are given. A one-pint heater requires 250 watts to start and 75 watts to maintain proper glue temperature; a four-quart heater requires 660 watts to melt the glue and 200 watts to maintain working temperature, etc.



Induction Motor Belted to Line Shaft—Wilmarth Plant.



Induction Motor Belted to Planers—Wilmarth Plant.

Sale and Uses of Waste Product.

The question of refuse and its disposal seems to be the main bug-bear when the central station is furnishing power. This is a mistaken idea for steam is needed at all seasons of the year in the manufacture of furniture. The main trouble along this line is that the refuse furnishes fuel for the greater part of the steam when the isolated plant is running and this gives the manufacturer an erroneous idea as to the exact cost of his power. There are many furniture factories that run entirely on refuse during the day but at night enough coal is used to make the cost equal to the cost of central-station power.

Regarding refuse, A. C. Martin, power engineer of the Rockford (Ill.) Electric Company, states that when securing the business of furniture factories, it should be the aim of the central station to teach conservation of the refuse

rather than disposal. For proof of this statement the Rockford company has a customer who is generating steam for dry-kiln work with the sawdust and storing the strips and other pieces of wood in the coal bin for use during the winter when steam must be kept on the building and dry kiln, twenty-four hours a day. Before investigation by the central station, the fireman in this particular factory was doing all in his power to keep the place rid of refuse —a few lessons in conservation has resulted in cutting down the cost of coal in this plant to a minimum.

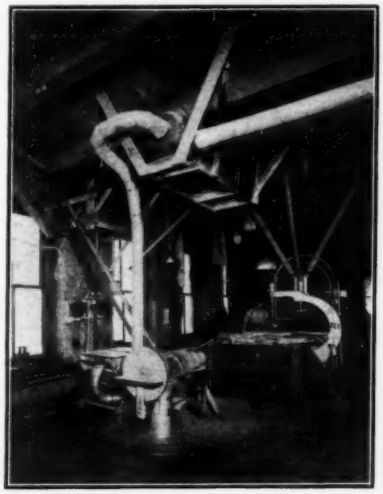
Many companies find an excellent market for refuse, selling both kindling and baled shavings. Of course the sale of this refuse depends upon local conditions. In Rockford, Ill., and Grand Rapids, Mich., th power companies have no trouble in disposing of the excess refuse of their customers. In the *Manufacturers' Record* of April 22, 1909, G. V. Borde calls attention to a process for obtaining valuable products from wood refuse, which, while not greatly affecting the small woodworking plant, offers startling possibilities to the large lumber mill and is a strong incentive to the further economizing of power through the electric drive. When properly treated every ton of perfectly dry wood or 3200 pounds of green sawdust will give

30 gals. of 188° alcohol at 40c	$12.00
76 lbs. of acetic acid at 6c	4.56
0.75 ton stock food at $23.00	17.25
Total	$33.81
Cost of production	7.00
Net value of products per ton of dry wood	$26.81
Net value of products per ton of green sawdust	16.8(

One and a quarter long tons, which is the approximate weight of 1000 feet of lumber, has, when transformed into above products, a value of $33.51. Assuming that it requires two tons of wood to equal one ton of coal in heating value and that the net returns from this process are but $10.00 per ton, it is evident that sawdust is not the inexpensive fuel which it has always been considered. The fact that many mills in this country turn out from 50 to 100 tons of wood refuse per day gives added significance to the economic possibilities of this process which is already in extensive commercial use both here and abroad.

Typical Motor-Driven Furniture Factories.

Some typical illustrations of the value of motor drive for furniture factories are found in the plant of the Wilmarth Show Case Company, Grand Rapids, Mich., manufacturers of high grade store and office furniture. For several years this plant was manufacturing with steam power. Machines were belted to lines of shafting which were driven by a steam engine. Exhaust steam was used for winter heating of the buildings and for dry kilns. The apparatus represented an old-style steam power plant.



Motor Driving Sander and Blower.

Sometime ago a new factory was erected. In the design of the buildings, special consideration was given the matter of power apparatus. An investigation resulted in the purchase and installation of a complete electric system for power, current being furnished by the Grand Rapids-Muskegon Power Company, the local central-station company. Even before the new plant was placed in operation one of the important advantages of motor drive was brought forcibly to the attention of the management. Inasmuch as motor drive does not require the heavy shafting inseparable from mechanical drive, the building itself may be of lighter construction, as the motors may be installed on the floor, wall, or ceiling and connected to the machines by short belts, or they may be directly coupled to the driving shaft.

The saving in the cost of building the average mill rendered possible by the adoption of motor drive will ordinarily, due to the lighter construction required, amount to about five per cent of the total cost of construction. In an old building motor drive will permit re-location of the machinery to facilitate and increase production and in addition will usually effect economy in the floor space required.

Having installed a modern system of motor drive, the Wilmarth company installed a high-pressure steam system with 200 horsepower in boilers for furnishing steam for winter heating.

An inspection of this plant shows the following advantages of motor drive: (1) Simplicity and economy of space; (2) economy in initial cost; (3) economy in operating cost; (4) superiority in compiling power-cost records; and (5) superiority in compiling production-cost records.

Considering the first, simplicity and economy of space, there is no engine room required and oil, labor and repairs for engine have been eliminated. The transformers, through which the supply of energy is received, are stationary and are located outside the building. Any oil, labor or repairs to these transformers are taken care of at the expense of the power company. The two boilers for the steam heating and dry kilns only, with the small space occupied, give evidence of the utmost simplicity of the system.

Direct-Current Motor Connected to Shaper.

Direct-Current Motor Connected to Planer and Blower.

The economy in initial cost is marked. According to figures of the company, about $9,000 was saved when the purchase was made as compared with the necessary investment if an engine and generator had been purchased for operating the electric motors. If, however, a steam power system had been adopted with shafting and belt drive requiring an investment for engine, generator, main and counter shaftings, the extra initial cost would have been much greater.

From the complete power records which have been kept, the economy in operating cost is at once apparent. As the Power Company assumes the losses on transformers, the Wilmarth company stands the losses simply for motors, hence a very high efficiency is secured with low operating cost. If an engine and generator were required to furnish power, the losses would commence with the coal on the loaded cars outside the building and would continue in the pipes from the boilers to the engine, from the engine to the generator, and thence to the motors or shafting. Under three-quarter time operation, or when individual departments were shut down, the losses would increase because of lighter load for the boilers, engine and generator, which is not true of central-station service, the losses of which are assumed by the Power Company.

Considering the cost of electric power compared with steam power (leaving out of consideration steam for heating and kilns) the following shows the monthly cost of operating on the basis of 23,000 horsepower-hours used for the month:

Electric.		Steam.
$ 65.00	Engineer	$ 65.00
	One fireman	45.00
	Interest and depreciation on engine and generator	110.00
	Repairs on steam plant	40.00
	Oil, waste, packing, etc., for engine, generator & pipes	20.00
	Coal	162.50
287.50	Current	
$352.50		$442.50

The cost per horsepower-hour for the electric system for the month was $0.015 as compared with $0.019 for the steam. For power only the electric system shows considerable saving over the steam system.

Assuming that twenty per cent of the exhaust steam, with an engine installation, could be turned into power, the amount would be saved on coal only and would be $32.50 a month. The cost would then be practically $0.018 per horsepower-hour for steam against $0.015 per horsepower-hour for electric power. The assumption however, is not a fair one, because in the summer time the kilns could use only about one-half the exhaust steam, so the saving would apply only to the winter months.

Summarizing on the cost of operation the greatest economy is secured by operating the kilns from live steam summer and winter, using such amounts of coal as the conditions warrant for the season. Sufficient shavings and wood refuse are available to operate the dry kilns and in addition an income of $60 per month is secured by the Wilmarth company for this refuse. This income practically offsets the wages of electric and steam engineer and reduces the cost to one and one-quarter cents per horsepower-hour for the electric system.

As to items Nos. 4 and 5—superiority in compiling power-cost and production-cost records—the Wilmarth company has used the curve-drawing instruments to advantage for testing the amount of power used daily and hourly on the entire plant and also for testing individual machines. Also meters are installed in each department which measure the amount of power used by each department.

The accompanying views of the Wilmarth plant show in general the arrangement of the motors and machines. In most cases the motors are mounted on the ceiling removed from the inflamable refuse. All wiring is run in steel conduit and all controlling appliances are totally inclosed.

The Wilmarth plant is equipped with 210 horsepower in 440-volt, thirty-cycle induction motors. With few exceptions group drive is employed throughout. The detailed motor equipment is as follows: one twenty-horsepower motor belted to a forty-eight inch three-drum Berlin sander; one twenty-horsepower motor belted to a line shaft driving a ten-inch miter saw, a ten-inch emery wheel, one ten-inch knife grinder, one twenty-four-inch Dodd dovetail machine, one thirty-six-inch Buss band saw, one two-head sander, one horizontal boring machine, one six-inch belt sander, one twenty-four-inch two-head broom sander a freight elevator, one eighteen-inch belt sander and one eight-inch belt sander; one twenty-horsepower motor belted to a line shaft driving one two-head Porter shaper, one emery wheel, one eighteen-inch Buss cut-off saw, one sixteen-inch Buss cut-off saw, one American upright boring machine and two sixteen-inch miter saws; one twenty-horsepower motor driving a single-end and a double-end tenoning machine, a ten-inch miter saw, one seven-inch and tw eight-inch stickers, one chain mortiser, one eighteen-inch double cut-off saw, one sixteen-inch miter saw and one eighteen-inch cut-off saw; one forty-horsepower motor belted direct to a fifty-seven-inch blower; one twenty-horsepower motor belted to a line shaft driving a thirty-six-inch single surfacer, one eight-inch Buss planer, one sixteen-inch rip saw and two sixteen-inch swing saws; one ten-horsepower motor belted direct to a Fay & Egan band resaw; one twenty-horsepower motor driving a thirty-inch single surfacer, two twenty-four-inch Porter buzz planers, one sixteen-inch table rip saw and one sixteen-inch swing saw; one ten-horsepower motor driving one miter saw, two boring machines, one drill press, one lathe and one hack saw; one ten-horsepower motor driving one twenty-four-inch blower, one twenty-four-inch single surfacer, one miter saw and two rip saws. In the glass department is a ten-horsepower motor driving three thirty-six-inch roughing wheels, two thirty-six inch smoothing wheels and three thirty-inch polishing wheels.

The kilowatt-hours consumption of this plant for a period of one year is as follows: (1911) January, 21,100; February, 22,600; March, 21,800; April, 24,500; May, 7,900; June, 14,200; July, 18,300; August, 20,600; September, 24,000; October, 24,000; November, 26,500; December, 23,600.

Another plant of more than passing interest is that of the Hafner Furniture Company, Chicago, manufacturers of sofas and couches. The majority of machines in this plant are driven by individual motors and the plant is equipped with an individual blower system. Some of the accompanying illustrations are views of this installation. All motors are 220-volt direct-current shunt-wound machines. The installation has been in for some time and has given little or no trouble. The refuse from the plant is sufficient to heat the building in winter and supply steam for dry kilns, and as a low-pressure boiler is used which does not require a licensed fireman, purchased power in this case effects a decided saving.

The following is part of the motor equipment of this plant. One fifteen-horsepower 1,000-revolution-per-minute motor direct-connected to an eight-inch sticker and a No. 2 blower; one ten-horsepower, 700-revolution-per-minute motor direct-connected to a forty-two-inch Columbia sander and a No. 2 blower; one ten-horsepower, 1,250-revolution-per-minute motor direct-connected to an automatic rip saw; one 7.5-horsepower, 1,525-revolution-per-minute motor belted to a double cut-off saw; one two-horsepower, 1,650-revolution-per-minute motor belted to a disk sander; one three-horsepower, 1,650-revolution-per-minute motor belted to table sander and No. 1 blower which also connects with the disk sander. A detailed list of motors and driven machines is given in the data sheets following.

Furniture Factory Data—Sheet No. 1.

The Rockford Superior Furniture Company, Rockford, Ill., manufacturers high grade china closets, buffets, etc. Combination drive. Running hours per week, 60.

Total connected horsepower, 199.5; total number of motors installed, 21; average kilowatt-hours per month, 13,645.

Kilowatt-hours, per month, for twelve months (1910-11): November, 15,570; December, 12,750; January, 13,080; February, 13,680; March, 14,710; April, 14,440; May, 11,260; June, 6,680 (half month); July, 11,630; August, 17,390; September, 12,470; October, 13,116.

MOTOR INSTALLATION

The following includes a list of the motors installed, with their respective drives. All motors are three-phase sixty-cycle induction motors operating at 220 volts.

No.	Horse-power	Speed	Application
1	40	680	Direct connected to a double forty-eight-inch blower.
2	10	1,100	Geared to two two-ton elevators.
1	1	1,700	Belted to glue clamp.
1	7.5	1,700	Driving a thirty-inch blower.
1	15	1,700	Belted to four-spindle sticker.
1	5	1,700	Belted to sixteen-inch rip saw.
1	3	1,700	Belted to cut-off saw.
1	15	1,700	Belted to four-roll sander.
1	15	1,700	Driving thirty-six-inch planer and thirty-six-inch jointer.
1	10	1,700	Driving line shaft to which is belted two resaws and one two-spindle shaper.
1	5	1,700	Belted to covering machine.
1	10	1,700	Belted to automatic double cut-off saw.
1	5	1,700	Driving cut-off saw and rip saw.
1	3	1,700	Belted to sixteen-inch cut-off saw.
1	5	1,700	Belted to sixteen-inch rip saw.
1	5	1,700	Driving line shaft to which is belted a belt sander, a spindle sander and a roll sander.
1	5	1,700	Belted to line shaft, driving one dovetailing machine, and one small tenoner.
1	10	1,700	Belted to line shaft, driving one twenty-eight-inch jointer, with automatic feed and one continuous jointer.
1	5	1,700	Driving one thirty-six-inch band saw and one jig saw.
1	5	1,700	Belted to tenoning machine.

This plant is one of the largest furniture factories in Rockford, and has been the means of securing other business in the town. The Rockford Electric Company has advocated conservation of refuse in this plant rather than the disposal of it. Sawdust is used for generating steam for dry-kiln work during the summer months, the strips and other refuse being stored in the coal bin to be used in winter when steam must be kept on the building and dry kiln, twenty-four hours a day. As a result of this policy no coal was used until December.

The Henderson-Ames Company, Kalamazoo, Mich., manufacturers of lodge furniture. Combination drive. Running hours per week, 54. Plant employes fourteen men.

Total connected horsepower, 31.5; total number of motors installed, 7; average kilowatt-hours per month, 632.

Kilowatt-hours consumption for twelve months (1910-11): December, 880; January, 970; February, 980; March, 700; April, 740; May, 480; June, 470; July, 290; August, 510; September, 470; October, 510; November, 580.

MOTOR INSTALLATION

The following includes a list of the motors installed, with their respective drives. All motors are sixty-cycle, three-phase induction motors, operating at 440 volts at a speed of 1,800 revolutions per minute.

No.	Horsepower	Application
1	3	Belted to Oliver dimension saw.
1	5	Belted to line shaft, driving one twelve-inch American belt sander, one Beach jig saw, one Porter turning lathe, one Fay shaper and one thirty-six-inch band saw.
1	7.5	Belted to a thirty-inch blower.
1	5	Belted to thirty-inch planer.
1	3	Belted to line shaft, driving one No. 2½ American horizontal boring machine and one Dodd swing cut-off saw.
1	3	Driving through belts a Jones No. 16 rip saw and a Fay & Egan twelve-inch jointer.
1	5	Belted to two Singer sewing machines.

Energy for this installation is furnished by the Commonwealth Power Company. Refuse from this plant is sufficient to necessitate purchasing only a small amount of coal.

The Rockford Cedar Furniture Company, Rockford, Ill., manufacturers cedar clothes chests and miscellaneous cedar furniture. Combination drive. Running hours per week, 60.

Total connected horsepower, 55; total number of motors installed, 8. This installation has only been in service since September, 1911, and the following kilowatt-hour readings are all that are available: September, 1,200; October, 1,800; November, 2,000.

MOTOR INSTALLATION

The following includes a list of the motors installed, with their respective drives. All motors are three-phase, sixty-cycle induction motors, operating at 220 volts.

No.	Horse-power	Speed	Application
1	15	900	Direct connected to four-roll sander.
1	10	900	Direct connected to thirty-six-inch planer.
1	5	1,700	Belted to double-spindle shaper.
1	5	1,700	Belted to twenty-four-inch blower.
1	5	1,700	Belted to tenoning machine and thirty-six-inch band saw.
1	5	1,700	Belted to small sticker.
1	5	1,700	Belted to thirty-inch jointer.
1	5	1,700	Driving swing saw and rip saw.

Furniture Factory Data—Sheet No. 2.

The Lewis Geer Manufacturing Company, Ypsilanti, Mich. Manufacture swing and lawn seats. Individual drive. Running hours per week, 48.

Total connected horsepower, 36.5; total number of motors installed, 7; average kilowatt-hours per month, 1,435; average kilowatt-hours per month per horsepower connected, 39.4.

Kilowatt-hours consumption for twelve months (1911): January, 1,525; February, 1,590; March, 2,280; April, 2,490; May, 2,230; June, 2,020; July, 1,510; August, 710; September, 1,125; October, 850; November, 480; December, 450.

MOTOR INSTALLATION

The following includes a list of the motors installed, with their respective drives. All motors operate at 1,800 revolutions per minute and are of the three-phase, sixty-cycle, 220-volt type.

No.	Horsepower	Application
1	7.5	Belted to thirty-inch two-drum sander.
1	10	Belted direct to eighteen-inch rip saw.
1	5	Belted direct to sticker.
1	5	Belted to shaper.
1	3	Belted to cut-off saw.
1	3	Belted direct to dowel machine.
1	3	Belted direct to band saw.

The Come Pact Furniture Company, Ann Arbor, Mich. Group drive. Running hours per week, 60.

Total connected horsepower, 35; average kilowatt-hours per month, 2,500; average kilowatt-hours per month, per connected horsepower, 71.3.

MOTOR INSTALLATION

The installation at this plant consists of a thirty-five-horsepower, three-phase sixty-cycle, 220-volt 1,800-revolution-per-minute motor, belted to a line shaft to which is connected one band saw, mortiser, tenant machine, trimming machine, boring machine, three drum sanders, one small blower and one automatic-gauge lathe.

Ft. Smith Couch & Bedding Company, Ft. Smith, Ark. Manufacturer of high-grade couches. Combination drive. Running hours per week, 60.

Total connected horsepower, 42.5; total number of motors installed, 8; average kilowatt-hours per month, 380; average kilowatt-hours per month per connected horsepower, 8.95.

Kilowatt-hours consumption for six months, (1911): July, 360; August, 360; September, 312; October, 456; November, 300; December, 492.

MOTOR INSTALLATION

The motors in this plant are all 220-volt, two-phase, sixty-cycle machines operating at 1,800 revolutions per minute. The following includes a list of the motors installed, with their respective drives.

No.	Horsepower	Application.
1	7.5	Belted direct to a double-end cut-off saw.
1	5	Belted direct to a twenty-four-inch planer.
1	5	Belted direct to trimming saw.
1	5	Belted direct to sixteen-inch hand jointer.
1	5	Belted direct to swing cut-off saw.
1	5	Belted direct to belt sander.
1	5	Belted direct to thirty-six-inch band saw.
1	5	Belted to line shaft driving one triple boring machine, one tenoner, one emery wheel, one single-spindle shaper and one tufting machine.

Hafner Furniture Company, Chicago, Ill. Manufacturer of sofas and couches. Combination drive. Running hours per week, 60.

Total connected horsepower, 102.5; number of motors installed, 19; average kilowatt-hours per month, 4,300.

Kilowatt-hours consumption for twelve months: January, 4,428; February, 7,440; March, 6,828; April, 5,244; May, 5,448; June, 4,332; July, 2,592; August, 1,896; September, 2,028; October, 3,564; November, 3,948; December 4,336.

MOTOR INSTALLATION

The motors in this installation are all 220-volt shunt-wound direct-current machines. The following includes a list of the motors installed, with their respective drives.

No.	Horsepower	Speed	Application
1	15	1,000	Direct connected to eight-inch sticker and No. 2 blower.
1	10	900	Belted direct to twenty-eight inch planer and No. 1 blower.
1	15	700	Belted direct to forty-two-inch sander and No. 2 blower.
1	10	1,250	Belted direct to automatic rip saw.
1	7.5	1,525	Belted direct to double cut-off saw.
1	2	1,650	Belted to disk sander.
1	3	1,650	Belted to table sander and No. 1 blower.
1	2	1,900	Belted direct to belt sander.
1	3	1,650	Belted direct to eighteen-foot band saw.
1	5	1,650	Belted direct to eighteen-foot band saw.
1	3	1,650	Belted direct to trim saw.
1	1	1,100	Belted to two-spindle boring machine.
1	5	1,650	Direct connected to two-spindle shaper.
1	5	1,100	Belted to line shaft driving embossing machine, six-spindle adjustable boring machine, reamer and turning lathe.
1	0.5	220	Belted to thirty-inch graining machine and No. 0 blower.
1	2	1,100	Belted direct to two hydraulic presses.
1	3	1,650	Belted direct to buck shaper.

There are also installed in this plant six portable electric boring machines and three motor-driven sewing machines.

Commercial Practice
Management, Rates, New Business

THE ATTITUDE OF A MANAGER TOWARD HIS NEW-BUSINESS DEPARTMENT

By Alexander F. Douglas.

This paper, by the assistant manager of the New-Business Department of the H. M. Byllesby & Company property at Portland, Ore., was read before the convention of the Byllesby Companies, at Chicago, January 2-5. The line of thought followed by the author is applicable to central stations in every part of the country. In this case it has proven desirable in one of the most successful gas-electric properties in the West.

The subject of the attitude of the manager of a public-utility corporation to his "New-Business Department" is of great importance, bearing directly on the efficiency of the new-business department, and affecting both the success of the utility company and the success of the manager himself. I wish to say that this paper was written and is being presented to you by a new-business man, one who thoroughly believes that the new-business department of any public-utility company is one of the most important departments of the utility company, and believes that in order to obtain its full value for the utility company it is essential that the manager give it his support, time, thought and advice.

The new-business department in a great many utility companies has been neglected; that is, I believe that the manager has not given this department the thought and consideration it deserves. It is not the intention of the writer to criticise any manager, but to bring out some points which, if followed up, will bring about closer relationships between the general manager and the new-business department and also between the new-business department and all other departments.

To my mind one of the greatest assets in the upbuilding of any business is co-operation and harmony both between the various departments and between the individual employees of the company. With this object in mind it is essential that the general manager keep in closest touch with all departments of his company, and especially with the new-business department, as this department comes in contact with all the other departments as well as with the general public.

I believe there should be monthly meetings held for the purpose of getting the various departments closer together, of discussing the work done, and advancing ideas for the betterment of conditions. The general manager should attend all such meetings, and if there be any friction between any of the departments adjust it then and there.

This would be a great help to the new-business department, as that department not only obtains the bulk of all the new business but also bears a great many of the complaints in the adjustment of which there are bound to be differences of opinion, which, if allowed to remain unsettled, will be the means of creating ill feeling, and hampering the work of the new-business department. These meetings would also give the new-business department employees an insight into the general methods employed in the handling of the work of the various departments, which in turn will assist the new-business department men in making out orders in the proper manner. This would result in such orders being taken care of more promptly and efficiently.

The new-business department is the mouth-piece of the company in that it is dealing with the general public more directly than any other department, and for that reason should be in closest touch with the general manager regarding the company's policy.

These policies should basically consist of:

Honesty;
Fair Treatment;
Good Service;
Reasonable Rates;
Willingness to correct mistakes.

The above should constitute the company's slogan and the new-business man, with this slogan in mind, and knowing that the company will support him in his acts along these broad lines, will be in a position to satisfy the public, bringing about that proper relationship between the company and the public which is vital to the success of every utility company.

The new-business department should have a good location for its office, equipped with good furniture, good desks, chairs, convenient catalogue and new-business files, telephones, etc. This department is receiving valuable data, all of which is of great help in obtaining business, and it should have proper files for permanently keeping such information.

The new-business office should be so arranged that in dealing with consumers and "prospects" there should be no interference by the general business of the office.

It should be supplied with one or more weekly or monthly publications from which new ideas can be obtained by the business getter, and by which the new-business man can keep posted on up-to-date and efficient methods of the application of gas and electricity.

The new-business office should also be furnished with a map showing all the company's lines and services, both gas and electric. In this way prospective consumers can be advised at once as to the time when they may expect service, and if the prospect is not located within the company's lines, whether or not he can be served. This would save a great deal of time and money.

The new-business men should be posted as to the station load-factor or gas output so as to give them the chance of going after business that is most desirable from a manufacturing standpoint. The information should include the peak load, gas and electric.

The new-business men should have charge of the advertising, both the placing and wording of the advertisements. The general manager should set aside a certain amount to be spent monthly or yearly; this appropriation to be made at the close of the year, and to cover all advertising costs (except general publicity work) for the ensuing year.

The new-business department should have one or more representatives belong to the Commercial Club or similar local organizations, the number depending on the size of the department in the discretion of the general manager.

The general manager should familiarize himself with the internal workings of the new-business department, so that each member of the new-business department would know the general

manager was interested in the results obtained, this would act as an incentive for every solicitor to make a good showing.

The work of the new-business man is not all sunshine. He has to stand a great deal of abuse and to listen to it with a smiling face, in order to try to win over the consumer and prove that the company is conducting its business on an honest basis, and is willing to rectify any mistakes on its part.

Should the solicitor loose his temper he would make an enemy with kind words and advice he would gain a friend, not only for the company, but for himself as well. It therefore behooves the general manager to speak a kind word and give encouragement to the men who are dealing with the public, and are trying to make friends for the company.

Before closing, I wish to make a few remarks to the heads of the new-business department drawing their attention to some of the things necessary to making their department a success.

See that your men report on time in the morning. If the time to begin work is 8:00 o'clock, they should all be at the office promptly at that time.

Give each man a certain district and hold him responsible for the business in his district.

Have each man make out a report every night which will give the amount of business he had done for the day. Hold meetings at least once a week for the purpose of discussing both the business obtained and the prospective business.

See that complaints which are handed to you by your men are taken care of and given to the proper party so that they will be given immediate attention.

Impress upon your men the necessity of making a neat appearance, to have their shoes polished, to have clean linen and to be clean shaven.

You and your men are representing one of the largest industries in your city, and you should be as neat as possible in your appearance, to be in keeping with the dignity of the company you represent.

One of the first duties of the new-business-department employees is to be courteous in their treatment of the public. Advise the consumer of the most efficient methods of installing light and power. See that the company's consumers are satisfied. Take care of complaints. It is up to your department not only to get new business, but to see that present consumers are getting the proper service, and their wants in the gas and electric line are taken care of.

Keep your desk and your files in order. Have your newspaper advertisements changed as often as possible and keep your advertising consistent with the business you are going after.

You are working under the direction of the general manager, and should confer with him on any subject which may be of importance to your department, or that may be for the general good of the company.

Above all things keep yourself in good order. You are at the head of one of the most important departments in the organization and should keep yourself and do your business in a manner that will be above criticism.

To conclude: In order to make the new-business department efficient and successful in its dealings with the public, it is necessary to have the friendly co-operation of all of the other departments of the company and the support of the general manager.

New York Edison Business.

The New York Edison Company has just completed a remarkable year of increase, with a gain in fifty-watt equivalents of 1,337,837 or 15.6 per cent of the lighting company's total installation.

Not only is this figure the largest ever reported in the history of the electric lighting industry, but the gain of more than a million and a third was made in the face of what is generally conceded to be a decided business depression in other lines.

On analysis, the figures become still more interesting. The increase represents new customers to the number of 19,912, a gain of 19.9 per cent.

The sources of the increase are interesting. Building activity has been distinctly less for 1911 than it was for the year preceding, so that far less of the gain comes from what might be called the wholesale class. In fact, the Company regards it as extremely significant that so great a proportion of the new business comes from what would be called the "small consumer," as represented by tremendous gains in the Bronx and very substantial ones in the east-side Delancey Street district. This "small business" is in some ways the hardest to get and keep, and an increase in this direction indicates the quality of service given the small consumer.

Other business conditions of interest were reported by the company's bureau heads. In the divisions dealing largely with manufacturing interests, such as power and heating, it was noticeable that although most of the persons dealt with bewailed hard times, they seemed anxious to install new and better appliances, the cost of these being apparently no bar. In general, manufacturers were found to be installing additional equipment in anticipation of a resumption of "big business" in 1912.

Replacing Carbon Lamps in Residences.

Starting last September the Grand Rapids-Muskegon Power Company, Grand Rapids, Mich., inaugurated the policy of having representatives of the company call on every one of the company's 3,500 residence customers and demonstrate the merits of the tungsten-filament lamp. In September 600 Tungstens were placed, in October 800 and in November 1,000. All were of the forty-watt size. The company states that in many cases the reduced lighting bills influenced customers to purchase flat irons, toasters and other domestic appliances.

Boston Edison Reduces Rates.

Beginning March 1, the Edison Electric Illuminating Company of Boston Mass., will make a reduction in the maximum rate. After that date ten cents a kilowatt-hour instead of eleven cents will be the maximum net rate. This is the fourth reduction since June, 1906, when the rate was eighteen cents.

Vehicle Charging Stations near New York.

A hand-book describing automobile routes in New York suburban territory, and indicating the location of electric-vehicle charging stations, has just been published by the New York Edison Company. It is being distributed by the company, by electric-vehicle manufacturers at their sales rooms, and by the exhibitors at the Garden, Palace and Waldorf-Astoria Shows.

The stations in New York are classified by their locations, the city having been divided into several sections for this purpose. Suburban towns are arranged in alphabetical order. Distances from Columbus Circle, and distances between points in New York are also indicated. Included with the book is a map showing the roads in the territory between Bridgeport, Conn.; Greenwood Lake, Trenton, Asbury Park, N. J., and points as far as Smithtown and Babylon, L. I.

New Commonwealth Edison Exhibition Room.

In order to be able to demonstrate various electrical apparatus to new customers—both resident and commercial—at the time of signing a contract, the Commonwealth Edison Company, Chicago, has fitted up a new exhibition room adjacent to the quarters occupied by the contract department and easily accessible from it. A rather complete line of domestic appliances, lamps, fixtures, small motors and miscellaneous apparatus is exhibited. O. E. Carpenter, of the heating and specialty department, is in charge.

NEWSPAPER ADVERTISING.

By W. H. Hodge.

Each year finds more converts to belief in the efficacy of publicity for central stations and other public utilities. Lately the new believers have been coming forward by scores. Skeptics, doubtless, are destined to disappear.

Advertising is a help. It is not a remedy for things that are wrong. Behind every successful advertising campaign is a sound sales plan and a commodity of genuine usefulness. Back of every organization that has increased public good will by publicity, is a band of management that deserves confidence and success.

Advertising of all kinds is not a question of literary or pictorial gymnastics. It is an issue where experience, knowledge and common sense count the heaviest. It is just as important that an advertiser understands thoroughly what he is talking about, as to know what to say and how to say it.

Whether or not a central station does any other kind of advertising, it should patronize the advertising columns of the local press habitually and systematically. A greater number of readers can be reached more often and more economically in this way than by any other means.

The central-station business is a retail business. It sells a little of something to many. That is all the reason necessary for persistent, intelligent advertising. There are other reasons, but this one is enough.

To make newspaper advertising successful only one recipe is required, to-wit: make it fit good salesmanship and good management, and give it a a fair amount of attention, time and brains.

Rate Adjustment in Muskogee.

Replacing the agitation for the purchase by the city of the plant of the Muskogee Gas and Electric Company, one of the Byllesby companies, operating in Muskogee, Okla., an agreement has been reached between the company, the city and the Commercial Club for the submission to the people of a proposed ordinance extending its franchise in case the agreement is ratified by the Chicago office of the company.

The new ordinance provides for 11-cent current, three cents lower than proposed by the company; school, city and county rates, five cents net; purchase privilege by city at end of 25 years; city to receive one per cent of gross receipts; City Council to have exclusive regulation, including rates charged to patrons.

Cost of Operating Electric Trucks.

One of the manufacturers of electric commercial vehicles furnishes general average operating costs for the three models which it makes. Fixed charges on the delivery wagon amount to $303 a year for interest and depreciation on non-wearing parts; maintenance for maximum service, $389.50 a year; garaging, including charging current, $108. This amounts to $800.50 a year, or $2.66 per working day, not including drivers' wages. At $15 a week, wages would bring the total daily cost to $5.16. On the same basis the total cost of running the light truck is $5.63 a day and that of running the heavy truck $6.91 a day. Larger and heavier makes of electric trucks cost from $7 to $8 a day to operate.

According to the testimony of large business houses, it costs from $6 to $6.50 a day to keep a wagon and team of horses at work, but the electric truck does the work of three such outfits.

Premiums for House-Wiring Contracts.

The Rockford (Ill.) Electric Company rigidly refrains from doing any interior wiring, turning over its house-wiring contracts to the seven electrical contractors in that city. A regular schedule of assigning jobs is maintained so that each receives an equal share of the business. Should, however, a contractor secure a contract to wire a residence on his own initiative, the Electric Company pays a premium of $3 to such contractor.

This policy, according to the company, has been instrumental in securing business which otherwise would have been difficult to secure.

All of the contractors handle both gas and electric fixtures, and it is held that often a customer who is examining the stock of gas fixtures is influenced by the contractor to purchase electric fixtures and have the house wired. The above offer applies only to old residences.

Mutual Benefit Association in Oregon.

Employees of the Oregon Power Company, Albany, Ore., have organized a mutual-benefit society, comprising, initially, twenty-five members. The organization is primarily for the purpose of effecting a close association for the interchange of ideas of the business, rendering the best service to the company, and to have the various meetings addressed by leading electrical men for furtherance of knowledge of current electrical work. The following officers have been elected: president, A. S. Harrington; vice-president, H. J. Fiesel; secretary and treasurer, J. H. Shea.

Lighting Rates in Long Beach, Cal.

The city of Long Beach, Cal., has entered into contract with the Southern California Edison Company for furnishing electric energy for street lighting and city purposes for the year 1912. The rates for lighting and power, which are the same as for the past year, are as follows: lighting in public buildings, five cents per kilowatt-hour; street lighting, all night, moonlight schedule; incandescent lamps, seventy-five cents per lamp per month; arc lamps, five dollars per lamp per month; power for city service, five cents per kilowatt-hour; power for pumping operations, from midnight to 6 a. m., one cent per kilowatt-hour; between 6 a. m. and 5 p. m., one and one-third cents per kilowatt-hour; from 5 p. m. to 9 p. m., two cents per kilowatt-hour; from 9 p. m. to midnight, one and one-third cents per kilowatt-hour.

Electric Baking.

The City of Vienna, Austria, has made an offer to the bakers of the city to supply them with electrically heated ovens at their own expense, it is true, but at the same time giving them a warranty that the cost of working the ovens will not be greater under the new than under the old system, while the evident hygienic and labor-saving advantages of electric heating will soon repay the cost of making the change in the heating methods.

Contract for Philadelphia Street Lamps.

The Philadelphia Electric Company has agreed with Mayor Blankenburg of Philadelphia, Pa., to reduce its rate for electric lighting of the streets during the current year.

The price per arc lamp will be $91.51 instead of $95.19, as heretofore. This reduction of $3.68 per lamp will amount to a total of over $51,000 in a bill of about $1,300,000.

Street Lighting Rates in Los Angeles.

The contract for street lighting for the current year in Los Angeles has been awarded upon the basis of $6.30 per arc lamp per month. The contract calls for 3,203 arc lamps at present in service and 500 to be added.

Milwaukee Railway Adopts Pensions.

The Milwaukee Electric Railway & Light Company has announced the establishment of an old-age pension system for its employees, and also a loan fund and a mutual benefit association. A small tax will be levied on the gross earnings of the company, which will enable it to contribute $30,000 yearly.

New York Jovian Lunch Club.

Jovianism in New York is certainly growing, and is growing in the right direction. The meetings of the Lunch Club are enthusiastically attended by the best element in the electrical business in New York. In further evidence of this, it is proposed that the next Rejuvenation in February be held at the Hotel Astor, where not only ample room and the very best cuisine can be had, but where the dignity of the organization will be maintained.

At the meeting of the Lunch Club on January 10, Arthur Williams gave an interesting address on the subject of "New Commercialism."

Among those present were: R. S. Satterlee, president of the Habirshaw Wire Company; B. M. Downs, vice-president of the Brookfield Glass Company; W. W. Freeman, vice-president of the Edison Electric Illuminating Company of Brooklyn; A. A. Pope, assistant general inspector of the New York Edison Company; M. A. Oberlander, assistant general supply sales manager of the Western Electric Company; H. H. Cudmore, Cleveland, O.; J. B. Olson, secretary of the Habirshaw Wire Company; T. Commerford Martin; A. S. DeVeau, president of the DeVeau Telephone Manufacturing Company; John Dale, president of the Dale Company; J. J. Gorman, vice-president of the Manhattan Electrical Supply Company; J. P. Hall; George Weiderman; Joseph Forsyth, chief inspector of the New York Board of Underwriters; H. T. Brainerd, of the Western Electric Company; C. C. Sibley, Sibley & Pitman; and V. C. Gilpin.

Reorganization of the Chesapeake and Potomac.

The reorganization of the officers of the Chesapeake and Potomac Telephone Company has been announced, which will result in Baltimore becoming the headquarters for Maryland, Virginia, West Virginia and the District of Columbia.

Final Awards in Government Condemnation Suit at Sault Sainte Marie.

In the United States Court Judge Arthur C. Denison has made final awards, amounting to $973,312, in the suit of the government to condemn for canal purposes all the lands and the rapids at Sault Sainte Marie, north of the present "Soo" canal, to the international boundary. Of this the Chandler-Dunbar Company gets $550,000 for its water power and $102,312 for its lands. The Edison-Sault Electric Company $300,000 for its power plant north of the canal; and the St. Mary's Power Company, $21,000. An appeal will probably be made.

New Apparatus at Pennsylvania State College.

The Department of Electrical Engineering, of Pennsylvania State College, has received a specially designed harmonic set, manufactured by the General Electric Company. It consists of three three-phase alternators, the fields of the three machines being mounted on the same shaft. The largest of these generators is for 60 cycles the second for 180 cycles, and the third for 300 cycles. The pressure waves developed by all three machines, or by any two of them, may be superposed, and the waves themselves may be displaced by any desired amount. The harmonic set, in connection with the three-element oscillograph purchased several years ago, provides equipment for exhaustive study along certain lines of alternating-current. This apparatus was purchased primarily to permit Professor C. L. Kinsloe to continue his experiments on incandescent filaments.

The School of Engineering has upon the ground the fabricated steel for a 200-foot tower to be used in the construction of new antennae. The foundations for the tower are now being constructed near the Electrical Building, and near its base will be placed a small brick building for the apparatus, consisting of a motor-generator, five-kilowatt transformer, and the wireless apparatus proper. N. H. Slaughter is in general charge of the installation.

Cornell Men Dine on Institute Night.

The Cornell alumni in attendance at the monthly meetings of the American Institute of Electrical Engineers in New York City are forming the habit of getting together for dinner at the Cornell University Club, 65 Park avenue. A large and representative attendance has already been built up and all are enthusiastic as to the possibilities of the plan in promoting interest in the Institute and in forming or renewing college ties. Cornellians who expect to attend the reunions should notify the steward of the club a few days in advance, and for the purpose of these reunions the club has extended its privileges to non-member Cornellians.

State Development of Water Power Recommended in New York.

The Conservation Commission of New York in its first annual report to the Legislature recommends the enactment of laws which will permit the State to go into the business of developing its water powers and rendering this power available for public and private use at such charges as will yield a public revenue and stimulate the development of industries.

The New York Automobile Shows.

The annual Madison Square Garden Automobile Show opened in New York City on January 6. This is the last time a motor-car exhibition will be held in this historic setting, as the great auditorium and garden is to be replaced by a more modern and enlarged structure. The attendance was very large despite the fact that a blizzard was raging outside. The decorations as usual were of a highly spectacular order, electric lamps and festoons contributing to a brilliant scene. All told there were about fifty-nine makes of cars on display, the total of exhibitors amounting to 401. The accessories, which occupied some 320 stands located in the basement, on the elevated platforms, and in the galleries, were more complete than ever before in the history of the automobile industry.

The exhibit of purely electric vehicles was worthy of note, the conspicuous examples of electrics being the Waverley, Anderson, Baker, Flanders, Grinnell, General Vehicle, Studebaker, Ward, and Lansden.

Among the accessory exhibitors those well known to the electrical industry were the National Carbon Company, General Electric Company, United States Light & Heating Company, Electric Storage Battery Company, Edison Storage Battery Company, Willard Storage Battery Company, Ward-Leonard Electric Company, Gould Storage Battery Company, Niagara Lead & Battery Company, C. F. Splitdorf, Remy Electric Company, Connecticut Telephone & Electric Company, American Circular Loom Company, Dean Electric Company, and The Esterline Company.

A number of very complete displays of magnetos and magneto ignition systems were shown, and electric lighting systems such as the Vesta, Gray & Davis, Rushmore, Deco and Esterline attracted a great deal of attention. Electric horns were also very much to the fore.

The General Electric Company made a special display of reflectors, sockets, switches and plugs for use with head, side and tail lamps, provided with drawn-wire Mazda lamps, receiving current from a storage battery. This company also made an extensive exhibit of its rugged, dust-proof, high-torque motors, exhibited with a full equipment of controllers and instruments as well as a complete mercury-arc rectifier charging set.

The automobile show at the Grand Central Palace was opened on January 10, with 150 exhibitors showing motor cars and accessories. Of this number thirty-eight were devoted to pleasure cars and there was an equal number of commercial cars on view.

Electrical Construction

NOTES ON ELECTRICAL CONSTRUCTION.

By George J. Kirchgasser.

This is the third of a series of articles on electrical construction. The matter will be treated in a thoroughly practical manner, and will cover every phase of construction usually encountered by the electrical contractor or the electrician in an industrial plant. This article discusses in detail some of the usual types of interior wiring.

Metal Molding.

The second of the two preceding articles of this series was devoted to the consideration of open wiring, in which the conductors are run either on

Fig. 1.—Metal Molding.

knobs or on cleats, and to a discussion of that type of wiring in which wooden molding is used to support and, at the same time, conceal the wires. Before the subject of molding is dropped, some account of the use of metal molding in interior wiring is necessary.

An improved form of metal molding came into general use about three

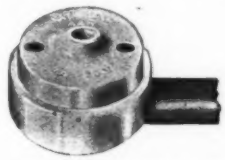


Fig. 2.—Rosette for Metal Molding.

years ago, molding of this type having been but little used prior to that time. Like the wooden product, metal molding is composed of a base and capping. Two brands of this material are now approved by fire insurance inspection departments and are in general use. These are the "National," made by the National Metal Molding Company, and the "Lutz," which latter the American Circular Loom Company manufacture. Metal molding is usually about one

Fig. 3.—Metal Molding Backing.

inch wide, and lies flat enough on the surface to which it is attached to prevent its being conspicuous or unsightly. From Fig. 1, which is a photograph of a section of National molding, it will be noticed that in the case of this particular brand of the product in question the capping is snapped or sprung over the base and is thus held

Fig. 4.—Metal Molding Switchbox (Base).

in position without any nails, which latter have already been seen to be necessary always for holding wooden molding in place. The use of nails for securing the capping is avoided with Lutz metal molding by slipping

Fig. 5.—Metal Molding Switchbox (Top).

the capping into grooves in the base after the wires are in place.

National metal molding is treated by a "Sherardizing" process, which forces finely divided zinc into the pores of the metal while the latter is kept at a very high temperature and thus forms a permanently non-corrosive zinc alloy over the surface. The desired surface is obtained on Lutz molding by an electro-galvanizing process.

In the installation of metal molding, the base is first attached to the surface to be wired over, this being accomplished usually by means of screws inserted in holes about twenty-four inches apart, which are punched and countersunk for the purpose. Where passing over projections or uneven surfaces, both base and capping must be bent to conform to the surface. When the base has been installed and the wires laid in place, the capping is ap-

Fig. 6.—Capping.

plied by one or the other of the two methods just described. Adjacent lengths of the backing, or base, are always joined by a base-coupling, a type

Fig. 7.—Tee.

of which is illustrated in Fig. 8. Thus all the lengths of the molding are united into a continuous metallic run.

Complete lines of fittings have been designed for use in metal-molding installations. These include tees, crosses, elbows, outlet boxes, switchboxes, bushings, rosettes, couplings, ground clamps, and the like. Some of these fittings are shown in the accompanying photographs.

Fig. 8.—Base-Coupling and Ground Clamp.

For exposed wiring construction, such as is often employed in wiring old buildings, and for wiring on steel ceilings metal molding is well adapted. It is also suitable for running circuits in show windows, show cases, and in

other similar places. Since it takes oil and water paints readily, it can always be painted to match any walls or ceiling on which it may have been installed.

Metal molding is essentially a raceway for the wires of branch circuits. It is used on branch or other circuits not carrying over 660 watts—as, for example, on a circuit supplying current to twelve 16-candle-power carbon-filament lamps, or eleven 60-watt lamps, or to an electric motor or other device not requiring a greater wattage than that just mentioned. There is sufficient space in the molding for four No. 14 single-braid rubber-covered wires. Ordinarily, of course, only two wires are installed in a run of molding, as this number constitutes a circuit; but sometimes a third wire is added in order to make a switch loop, and, in

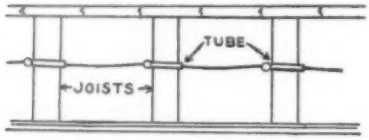


Fig. 9.—Method of Installing Tubes.

the case of double-pole switch loops, the number is increased to four.

Wherever it is run down a wall below a point five or six feet above the floor, metal molding should be protected from mechanical injury. Sometimes this protection consists of an iron pipe through which the molding is run. Another practice consists in terminating the molding five feet or so above the floor and running the wires below this point in iron conduit. In no case should molding, either metal or wooden, be run where it will be exposed to mechanical injury; for an accidental removal of the capping would permit the wires to fall out, which might lead to their being damaged. Neither should molding be installed in places subject to any considerable amount of moisture; nor should it ever be run concealed, as be-

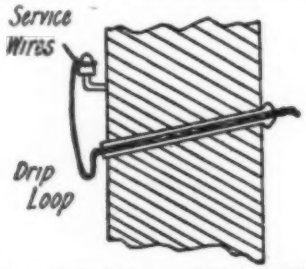


Fig. 10.—Bushing to Service Wire.

tween walls or partitions. The National Electrical Code limits the voltage of the circuits on which metal molding may be used to 300 volts. This restriction, however, has but little bearing on the use of metal molding on lighting circuits, since these are usually operated either at 110 to 115 or at 220 to 230 volts.

For awhile after the use of metal

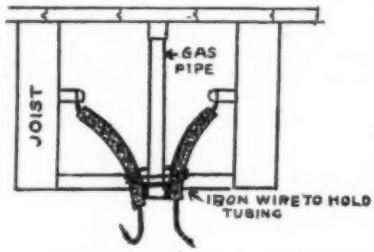


Fig. 11.—Combination Fixture Outlet.

molding was introduced in the wiring of interiors, the Underwriters approved only double-braid rubber-covered wire for metal molding work. However, since the wires do not have to be pulled in, as in wiring with conduit, single-braid rubber-covered wire has lately been approved.

Metal molding, being a conductor of electricity, must be grounded; so that in case a leakage of current from the wires occurs as a result of defective insulation, a poor fitting, an improperly wound splice, or from any other cause whatsoever, a path will be provided for carrying this leakage current to the ground. If the leakage current is considerable, the fuse will be blown. It was noted above that in installing metal molding, adjacent lengths of the backing or base are joined together

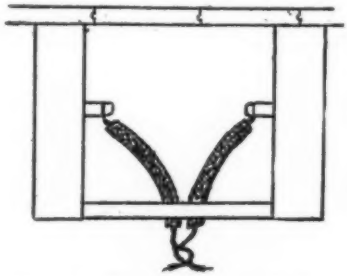


Fig. 12.—Electric Fixture Outlet.

by means of base-couplings. It is necessary, too, to secure all fittings, such as rosettes, crosses and tees, in such a way as to make the metal a continuous electrical conductor.

A ground clamp of the type shown in Fig. 8 should be used with each installation. From this clamp the ground wire is run. This wire should be attached to a water pipe, preferably on the street side of the meter. As the water pipe is embedded in the earth, this arrangement will carry any leakage current from the molding to the ground, where it will be dissipated. Copper wire is used in grounding. This must not be smaller than No. 10 B. and S. gauge. There will be a further discussion relative to grounding metal moulding, and also other inside wiring construction, however, in the section devoted to conduit wiring, which will follow the treatment of the so-called "knob and tube" system of concealed circuits.

The Concealed Knob and Tube System.

In this system the wires are always concealed from view between floors and ceilings, within partitions or walls, or in other similar places. The conductors are held in place here by means of porcelain knobs and tubes. While knob and tube work costs more to install than open wiring, it is the cheapest type of concealed wiring. More-

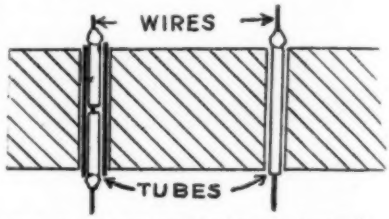


Fig. 13.—Another Method of Installing Tubes.

over, it is a vast improvement over older types of concealed wiring, which permitted the running of wires in the plaster on walls.

The knobs, which are usually of the same kind as those employed in open wiring, hold the wires an inch away from the surface to which they are secured, and where the conductors run parallel with the joists, the knobs are placed about four or five feet apart. Where the circuit is carried past any projection, the conductors, are run in either flexible or rigid tubing and knobs enough are used to support and insulate the wires thoroughly. Single-braided rubber-covered wire is approved for knob and tube systems. Fig. 9 indicates how the wires are supported, how the joists are bored, and how the porcelain tubes are inserted in the holes and the wires pulled through. The two wires of a circuit are usually run from about five to ten inches apart, five inches being the minimum distance allowed. However, in wiring old buildings, the existing arrangement of joists, beams pipes, and so on will often make it impossible to separate the wires even five inches

Fig. 14.—Porcelain Tube.

without going to the trouble of tearing up flooring and other parts of the rooms. In cases of this kind, where a five-inch spacing is impracticable, each wire of a circuit should be incased in

a continuous length of flexible tubing the entire distance that the wires are less than five inches apart. Also, when the wires are near each other at a switchbox or a lamp outlet each wire should be inclosed in flexible tubing from the last knob to the box or the outlet, as the case may be. Flexible tubing may be used on any system, provided the voltage does not exceed 300. Above this voltage conduit or armored cable must be employed.

In the knob and tube system of wiring tubes are used, of course, in large quantities. These tubes, one of which is illustrated in Fig. 14, are made in different lengths, from one and one-half inches to one or two feet. Where used as a bushing the size that will extend through the entire length of the hole

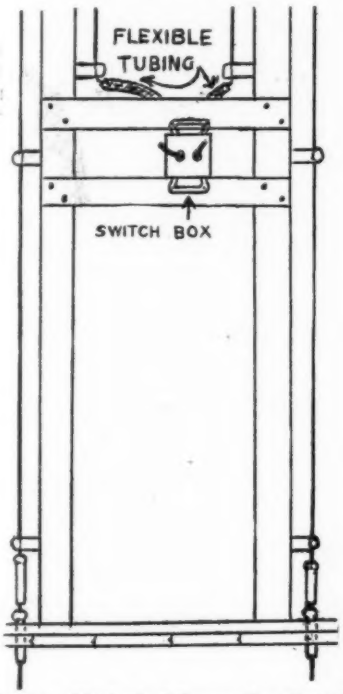


Fig. 15.—Method of Supporting Switchbox.

should be used. Figs. 9, 10 and 12 show several uses of the porcelain tube.

For concealed knob and tube wiring and open wiring, the three and one-half-inch tube, having an internal diameter of five-sixteenth-inch and an external diameter about five-eighths-inch, is used generally. Where passing through an outside wall (see Fig. 10) the tubes should be pitched so that the heads, which are on the inside, will be higher and will therefore hold the tubes in place. On the outside a loop called a "drip loop," is made in each wire so that moisture will be drained away from the tube.

Referring again to Fig. 9, it will be noted that the holes in the joists are bored slightly inclined. This is much better than boring them parallel with the floor, since it eliminates the possibility of tubes being shaken out of position by any vibration of the building or any portion of it. Sometimes wiremen even make the mistake of inserting the head of the tube lower than the other end. Where work is installed in this way, many of the tubes soon slip out of place.

Two ceiling fixture outlets are shown in Figs. 11 and 12, one of these being a combination gas and electric outlet and the other electric. The wires are incased separately in flexible tubing from the last supporting knob to a point below the gas cap in the first case, and to a point below the fixture block in the second. At the combination outlet both wires of the circuit are securely fastened by means of iron wire to the gas pipe, so that the tubing will not be removed by any other workmen—such as lathers, carpenters, plasterers and fixture men—who may follow the electrician on the job.

Where there is no gas-pipe outlet, means for supporting fixtures and drop lights should be provided by nailing a wooden block seven-eighths of an inch thick between the joists. This makes a substantial support for a lamp or a fixture of any of the usual types. With a combination fixture no such block is necessary, for here the fixture can be screwed to the gas pipe itself. Fixtures and the installation of these will be discussed, however, in a later paper of this series.

For wall outlets and switch outlets, wooden supporting blocks are also employed. Fig. 15 shows a switchbox—in which a switch is to be installed—secured in place by means of two strips of wood. Note that the wires are provided with flexible tubing where they enter the box. Flush switches may also be used with concealed knob and tube wiring. Fig. 16 is a photograph of a box for a switch of the latter kind. One of these boxes always has several "knockouts," which, when given a blow with a hammer, leave holes through which the tubing can be passed. Boxes of this kind are also employed in conduit wiring.

When a surface switch is used, that is, one that sets completely upon the surface no box is required, for the wires are brought out just as in the case of the straight electric fixture outlet.

Fig. 13 also shows the method of supporting wires on side walls and partitions. Where a circuit passes through the floor, two tubes must be used on each wire, one to bush the hole and one to extend about four inches above the floor to protect the wire at the bottom from falling plaster and the like, which naturally settles between partitions. These tubes are referred to as "plaster tubes."

In two-inch partitions—that is, where the distance from the lathes on one side of the wall to those on the other is two-inches—each wire must be protected by flexible tubing because of lack of proper space for wires.

The "roughing in" work in wiring a new building includes only the wiring to the different switch and fixture outlets and often does not include basement work. This latter, together with installing the meter board, fuses, switches, and so on, is completed when the building is about ready for occupancy. The "roughing in" takes care principally of installing those wires which are to be concealed so that the lathers and plasterers can go ahead with their work.

In wiring a new building the "roughing in" work is finished long before the building is ready to be occupied.

In wiring old buildings, parts of the flooring must be taken up; and, as the walls and partitions cannot be attacked the same way, it is necessary to resort to what is known as "fishing" the wires. To do this, the wires are run to a point

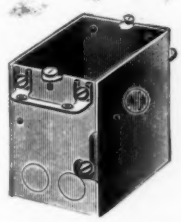


Fig. 16.—Switchbox.

above or below the wall or partition on which an outlet is desired. Then the plaster and lathes are broken at the outlet location, and a wire, to the end of which is fastened the circuit wires, each provided with flexible tubing, is fished, pushed or pulled to the outlet and the circuit wires pulled into place. In wiring old buildings, the different constructions make every job different. In locations where dampness exists, the fished work mentioned above is not allowed by the National Electrical Code, as the tubing might in time absorb moisture.

Joints and splices should be made very carefully in knob and tube work, since there is more danger than with open wiring because of the fact that there is no chance of any trouble at a joint being discovered after the building is completed. As rubber-covered wire alone can be used, both rubber and friction tape must be wrapped around the soldered joints.

Basement wiring is often done after the carpenters and builders have completed their work. In many localities only conduit work is used for basements. This is the best in all respects.

Use of Pilot Lights.

Every contractor is familiar with the use of the pilot lamp in connection with generating machinery, and would look askance at a proposal to fit up an engine room without a light being installed which was fed direct from the busbars. But the pilot light may be of value in ordinary house wiring, and may be instrumental in removing or preventing a good deal of complaint. It frequently happens that cellaring or stabling has to be wired, and it is connection with such parts of the premises that the principal waste of light occurs in practice. In wine or other cellars the switch is placed close to the door and the lights switched on when the door is opened. It is a natural action for the person visiting the cellar to switch on, as the cellar is in darkness and he cannot see his way. But on leaving the cellar the opposite is the case. The stairs are usually fairly light and in innumerable instances the person leaving forgets all about switching off. A pair of conductors run back from the cellar and stabling, in parallel with the lights therein, and connected up to a lamp-holder with a five-candlepower lamp therein, fixed in the kitchen or hall, and in plain sight of the household would show if lights had been left switched on, and would not only pay for itself in a short time, but would effect a further saving.—*The Electrical Manufacturer and Installation Engineer.*

Fig. 1.—Group of Motors.

Door-Bolt Switch.

Visitors in hotels seldom take the trouble to switch off lights in rooms when going out, and the waste which results from such indifference represents in the aggregate a substantial proportion of the lighting costs. Hotel proprietors, therefore, should welcome an automatic switching device which has been designed specially for the purpose. The switch in question is operated by the door lock. When the key is turned on the outside of the door, the bolt throws a solenoid into circuit, which by a cam motion operating on the push-button switch, throws it into the 'off' position, thus extinguishing the lights. The lights can of course be switched on or off by hand independently of the automatic feature at any time, the door switch operating only when the key is turned from the outside. Thus anyone who may remain in the room after the door is locked by another person going out still retains control of the lights in the room.

An Unusual Arrangement of Motor Circuits.

The cost of the compensator or auto-starter, as it is sometimes called, which is so generally used for starting induction motors having squirrel-cage rotors is in many instances a rather large fraction of the total cost of the motor equipment. Moreover, in locations where there is dust or highly combustible material the installation of this compensator in a proper and safe manner is sometimes an item of considerable expense. Hence if a single compensator can be used in starting a number of induction motors a great saving in the cost of the equipment may sometimes be effected. This plan has been tried out in a few instances, and where the proper size and type of auto-starter was employed, has been found entirely practicable and satisfactory. It may be added, however, that the practice is by no means common; in fact it is not generally known about. It is understood, of course, that in cases of this sort all the motors to

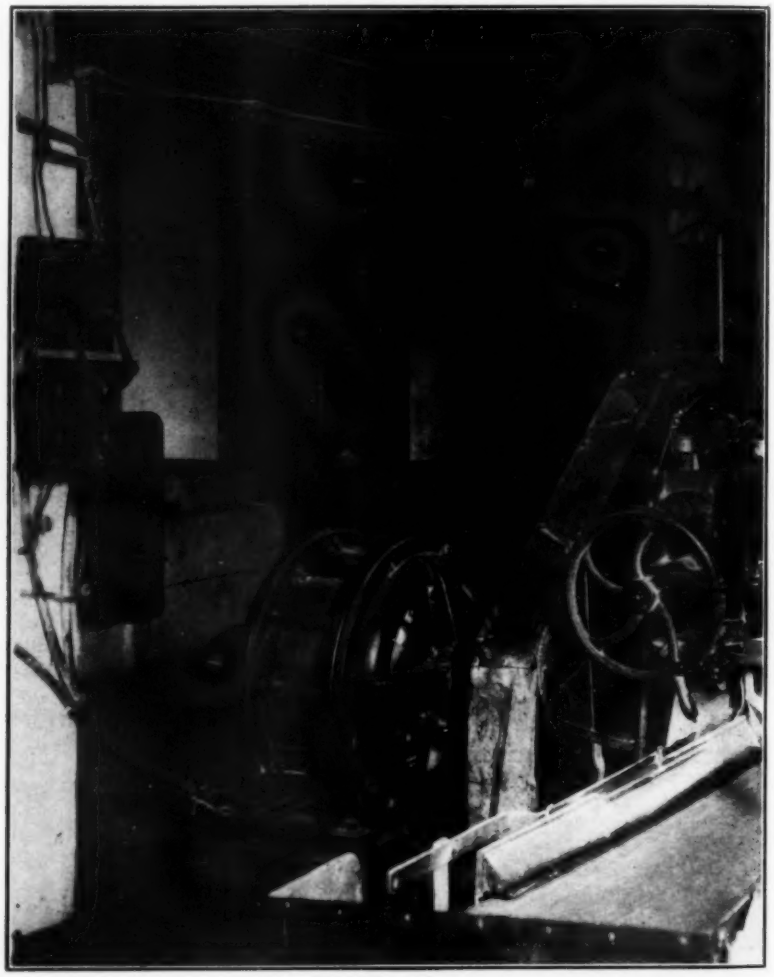


Fig. 2.—Showing Installation of Compensator and Motor Switch.

be started from the same compensator are located in the same room.

By far the most interesting installation of this kind that the writer has seen is that shown in Figs. 1 and 2, these figures being photographs of a section in the factory of the Postum Cereal Company, of Battle Creek, Mich. The machines shown in the two cuts consist of sixteen 35-horsepower, three-phase, 440-volt induction motors; each motor being directly connected to a grain crusher. The sixteen motors are started, one at a time, by means of one 70-horsepower compensator, installed as shown in Fig. 2. The arrangement of the circuits and switches is likewise indicated in the photographs, but is more clearly shown in the diagram of Fig. 3. From the switchboard at one end of the room three mains extend along the ceiling to the opposite end of the group of motors, the conductors being supported by means of heavy, single-wire, porcelain cleats. Below these conductors, and parallel with them, the starting circuit is run, the wires of the latter circuit being supported on vertical columns by means of porcelain knobs. The leads to each motor are attached to the middle points of a three-pole double-throw knife switch. The lower contacts of this switch are connected to the running circuit of the motors, and the upper contacts to the starting circuit. In starting the motors one of the machine operators, of whom there are four, stations himself at the compensator, and the other operators manipulate the motor switches. When it is desired to start any particular machine, the switch of that motor is thrown upward and the motor thus connected in circuit through the compensator. When full speed has been attained, the switch is thrown over into the running position, and the compensator thus becomes available for starting the next motor. It is found that the entire group of sixteen machines may be started in five minutes, or even in less time than this.

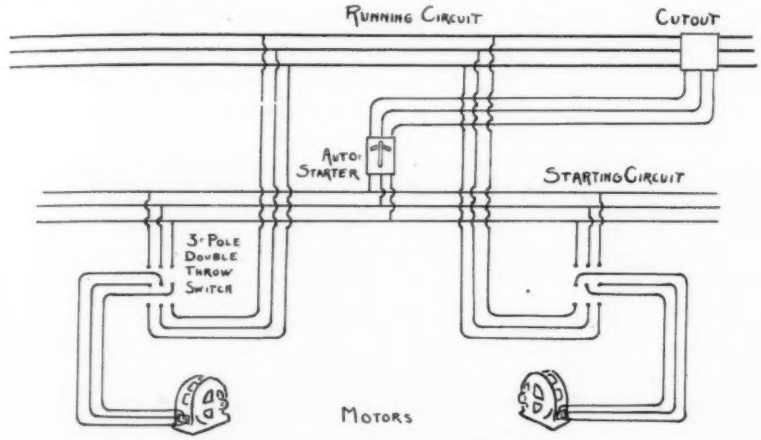


Fig. 3.—Diagram of Starting Circuit.

Fig. 4.—Group of Smaller Motors Started With Single Compensator.

The cost of a compensator for starting a motor of the type of one of these is approximately fifteen per cent of the cost of the motor itself. It is thus seen that the saving effected by the plan adopted in this installation was quite considerable. Moreover, less copper is required in the starting circuits than would have been necessary if each machine had been equipped with its own compensator.

Fig. 4 is a photograph of a smaller motor installation in another section of the country where the same plan of starting a group of induction motors is successfully employed.

Moving Picture Theater Fire.

On December 7, 1911, a fire occurred in the Lyric Theater in El Reno, Okla. An inspection and report were made by the Oklahoma Inspection Bureau, whose manager is C. T. Ingalls, and the inspector, L. A. Barley.

The fire originated in the picture-machine booth by the film coming in contact with the lamp house. This was due to the failure of the take-up device to work properly, the film thus being allowed to run out over the machine. The operator was outside of the booth rewinding a film when the accident occurred, but ran into the booth and tried to extinguish the flames with a coat. His efforts were unsuccessful and he was seriously burned in the attempt.

Two extra films outside of the booth were also destroyed. The three reels burned were supposed to be non-inflammable. The machine was operated with a motor and equipped with magazines for booth reels. The booth was of iron construction with a vent pipe to a second-floor hallway. The openings in the booth were not arranged to close automatically, and a small opening on the rear side, although equipped with a gravity door, was not closed during the fire. The operator was also unable to get the main door closed.

Canadian Pacific Will Adopt Telephone Train Dispatching in West.

The Canadian Pacific Railroad has announced a plan of dispatching trains by telephone instead of by telegraph, west of the Great Lakes. This system is already in use on its eastern lines.

ELECTRICAL INSPECTION.

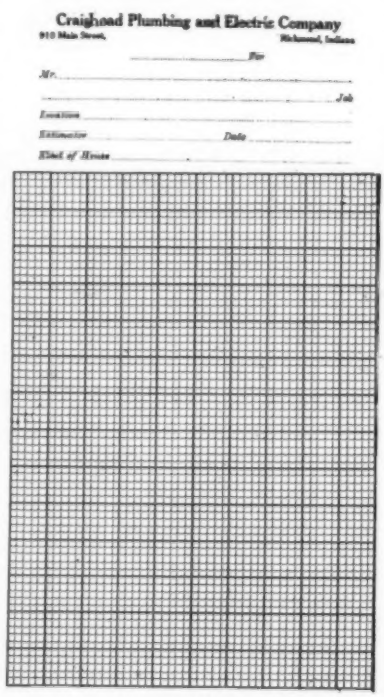
By William A. Murray.

The editorial in the January 6 issue on the subject, "Electrical Inspection in the Smaller Towns," would logically seem to furnish much food for good thought, as it apparently contains many suggestions which should prove of good practical value to those having such matters in charge, and last but not least does it not reveal in a more plain way than ever the decided absence of uniformity and standardization both in the matter of making inspections of electric wiring as well as the manner in which the work should be done? This conclusion is based on the fact that probably the suggestions made in the article referred to are based on average existing conditions. As an example of the absence of uniformity and standardization, we will suppose for the purposes of illustration that a certain piece of electric wiring is done in a town called A, which passes inspection in that town according to the rules of the local department. The same kind of a job done in exactly the same manner is performed in a town called B, but will not pass inspection in town B because it does not agree with the rules. It is common knowledge that such conditions do exist in a more or less aggravated form; therefore would it not be a sensible and practical scheme for those who have such matters in charge to set about creating a set of rules under which all could work, and be assured that no interference in regard to inspections would be met with if the same class of work was done in different cities or localities. Only in special cases do the conditions met with in the interior of buildings require a different consideration in one locality than they do in another, that is for buildings in which is carried on the same lines of business (except possibly the one requiring protection against mechanical injury). In buildings of the residence type there should be practically no difference, except the allowance that would naturally be made for buildings of different types of construction. Therefore it would seem logical to suppose that one set of rules could be made that would cover all possible conditions that would be met with in the ordinary course of work in this line. This done, then it should be possible to place all inspection work in the hands of one unbiased department, such, for example, as is now done in some localities where most all of the good insurance companies require that all electric wiring and electric machine work shall be in accordance with the rules and requirements of the National Board of Fire Underwriters. In the localities referred to it is not uncommon for the main office to take care of all work within a radius of from fifty to seventy miles. While it is common knowledge that there now exists a very great difference of opinion amongst inspectors as to just how certain classes of work should be arranged, it does not seem unreasonable to suppose that things in the line of electric wiring have reached the point where representatives from each section could meet in convention and fight out to a finish some definite conclusion, which conclusion could be modified or changed at certain stated intervals of time if experience taught that any change was desirable.

ESTIMATING.

By George W. Craighead.

This subject should be given careful consideration by every contractor, as it is without a doubt one of the most important features connected with his business. There is any number of classes of work which it is necessary to estimate.



Sheet for Estimating House Wiring.

Where plans and specifications are furnished from which to estimate, it is necessary to go over them carefully and in a systematic manner. In figuring from such plans and specifications it is well to check all outlets, switches and cabinets as well as all corresponding paragraphs in the specifications with a red crayon pencil. By doing this you can tell at a glance whether you have included everything in your estimate, and it also prevents you from figuring the same work twice.

A very large per cent of work estimated is not done from plans and specifications, particularly so in the case of old buildings. This is a class of work that requires a man thoroughly competent to estimate, and it is always necessary for him to make observation of the building to be wired.

To assist in estimating, a properly formed blank should be used. The blanks may be of various sizes and with different headings. (See cut.) The lower part of the estimate sheet can be arranged on a one-eighth inch per foot scale and blocked out in 5 by 5 feet squares. It is the work of but a few minutes with the aid of this sheet to make a plan of the building, using as many sheets as there are floors, provided, of course, the floors differ from each other. When the general outline is completed, the exact location of lights, switches, etc., may be shown so that the same could be readily understood by any one. It not only assists in estimating the work, but also greatly assists the workman who installs same, as well as eliminating a large per cent of disputes with the customer, which are usually due to some misunderstanding.

A large number of contractors estimate their work at so much an outlet. For various classes of work this can be made very accurate where the class of work done always remains the same, but as a general rule a contractor reaches all classes of work, and since every job is entirely different it is not as accurate to figure this way as to figure each one separately. It is a very good plan to check your estimates by figuring so much an outlet, but for accurate estimating this is not to be recommended.

Repairing Annunciator Circuits.

The following is a good and cheap way for a temporary or permanent repair for elevator annunicator cables. If the common wire in the cable should part and could not be located, the annunciator can quickly be put in service by grounding the common return wire at the annunciator to the frame or to the screen of the car, and then grounding one side of the batteries to the frame or to some part of the machinery near the cable drum. The current will follow the hoisting cable from the batteries to the annunciator. Should it be any other conductor in the cable which is defective, the common wire should be put back to its place and the test continued by grounding other conductors until the right one is discovered. The job is, in most cases, a very simple one.

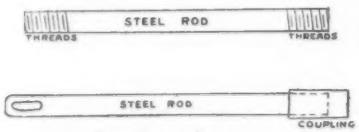
W. Don Davis.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Another Way to Run Wires Between Walls.

Electricians often have trouble getting wires down or up inside a wall, especially if the upper and lower holes through the plates are not vertically over each other, or if there are cross braces inside the walls. On such jobs as this I use a steel rod, through a hole on one end of which the wire is threaded. The rod, which I made myself, is built up to any desired length of twelve-inch bars of cold-rolled steel, the diameter of the bars being approximately three-sixteenths of an inch. Each twelve-inch section of the rod—except the one having the hole for the wire, of course—is threaded on both



Tool for Wiring Between Walls.

ends, and adjacent sections are held together by means of a short coupling having the same thread on the inside at either end. If it is preferred, the couplings may be knurled, and a coupling pinned permanently on one end of each section of the rod. I carry sections enough in my tool kit to make up a rod fourteen feet long I find that with this device I can fish wires in walls much more readily than is possible usually with a chair and fish wire. Moreover, as already suggested, this tool can be used successfully where the fishing chain cannot be readily applied. The accompanying figure shows two sections of the rod.

William McIlrath.

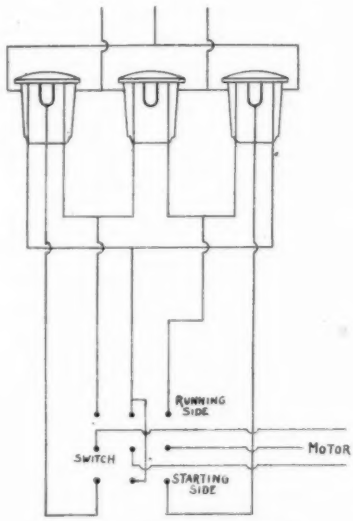
Concerning Alternating-Current Bells.

Not long ago we were called upon to install some door bells and door openers which were to be operated on sixty-cycle alternating current, a pressure of from eight to twelve volts being supplied at the bell and opener terminals. On the initial test, we found that the smaller bells responded readily to the current, but that the larger, slowly-vibrating gongs and door openers would not respond at all. We concluded finally that the failure of these latter appliances was due to the relatively great reactance of their large coils, so we secured some pieces of brass fixture-shell of the diameter of the coils, cut them into short cylinders and slipped one of these over each coil, the arrangement being such that each coil was inclosed throughout its length by a snugly fitting cylinder of brass. When this had been done all the bells and door openers worked splendidly, and they continue to work as well as ever.

A. B. Dungan.

Starting the Motor Without A Compensator.

The rather natural desire on the part of users of induction motors to keep the initial cost of the motor installation as low as is consistent with good service, has led to the development



Transformer Connections.

of several different schemes for avoiding the necessity of using a compensator for starting machines of the squirrel-cage type. In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 6, J. S. Colburn described a scheme for using transformers for this purpose having special taps for providing the low voltage needed in starting the motor. Close inspection of Mr. Colburn's diagram, however, discloses the fact that the arrangement proposed would lead to portions of the winding of each transformer being short-circuited while the motor switch was in the starting position. Nevertheless, the desired object may be attained by the use of ordinary lighting transformers, and the accompanying diagram indicates a proper method of connecting these to the line and the motor. The three-pole, double-throw switch employed is thrown into the running position as soon as the motor has come up to speed. It is probably well to add, in this connection, that care must be taken where such a scheme is used not to burn out the transformer coils used for starting, since the starting current of the motor is liable to be two or three times the full-load running current.—Editor.

Scheme for Testing the Current.

Some confusion has been caused here lately by the central-station's having changed the service from direct to alternating current in some sections of the city. Owners of small motors have had trouble, of course, when they have failed to substitute alternating-current machines when the service was changed. Nine-tenths of the motor troubles which I have been called upon to remedy recently were due to this cause. Since I cannot always be sure which kind of current is supplied to a given section of the city, I have resorted to the following expedient: I take a strong permanent bar magnet and present one pole of it to a burning incandescent lamp—a carbon filament lamp, of course. If the filament is attracted or repelled, I know direct current is being supplied to the lamps.

Fred A. Jerram.

Remote Control for Motors.

In a certain shirt factory most of the machines were driven by small direct-current motors, and the manager wanted an inexpensive arrangement provided whereby any operator could stop the motor driving the machine of which she had charge quickly, without having to go to the motor switch, the switches and starting-boxes not having been located as conveniently as they should have been. What we did was to run a shunt around the release magnet on each motor and, carrying the shunt wire to the operator's table, place a push-button switch in this circuit on the table. When this switch is pushed the release magnet opens the armature circuit of the motor of course.

Fred A. Jerram.

Large Mexican Hydroelectric Project.

A large hydroelectric plant is to be built on the Balsas River in the State of Guerrero, Mexico. It is said that the company developing the project has $14,000,000 available for the work. The contracts for the construction and equipment, which will be begun shortly, has been let to the Siemens & Halske Aktiengesellschaft, of Berlin, Germany. The plant is to be built primarily to supply power to mines.

Among the Supply Men

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION MEETING IN CLEVELAND.

The Electrical League of Cleveland Planning a Royal Welcome and Entertainment for the Jobbers Next Month.

The next regular meeting of the Electrical Supply Jobbers' Association will be held in Cleveland, O., February 13, 14 and 15. Sessions will be held each day and the jobbers will be addressed by men prominent in the industry, the subjects for discussion being of a nature peculiar to the electrical supply and jobbing interests.

More than ordinary interest attaches to the coming meeting, because the Cleveland supply men and the electrical interests of that city made a big campaign several months ago to secure this meeting. It was felt by the Cleveland electrical people that in view of trade conditions it was peculiarly fitting that the meeting should be held in that city, and outside of an instructive program, so far as form of discussion is concerned, it is expected that the entertainment and social features will eclipse anything heretofore tendered to the visiting jobbers.

The entertainment features are to be given under the auspices of the Electrical League of Cleveland. On the evening of Tuesday, February 13, there will be a Rejuvenation of the Sons of Jove in charge of Philip S. Dodd, statesman-at-large of the Sons of Jove and secretary of the Commercial Section of the National Electric Light Association. The Rejuvenation will be held in the new lodge room of the Elks' Club and it is expected that a big class will be initiated into the order. A special degree team is being trained, and no more fitting and beautiful setting for the imposing ritual of the order could be selected in any other place in the country.

On the evening of Wednesday, February 14, a valentine entertainment and smoker will be held at Gray's Armory, where a very elaborate vocal and instrumental program will be offered. There will be seating arrangements for a big delegation and immediately following the lighter entertainment features, a collation will be served without the guests leaving the room. The vocal and instrumental entertainment will be supplemented after the collation by an athletic exhibition. The entertainment is under the direction of Herbert H. Cudmore, president of the Brilliant Electric Company, and this assures an evening of thorough enjoyment and high-class entertainment for all who are privileged to attend.

The decorations will be unique and of an electrical nature, which will give an expression of the most recent adaptations of electrical and artistic innovations for the illumination and embellishment of a large interior. This is under the direction of J. T. Kermode of the Cleveland Electric Illuminating Company.

On Wednesday and Thursday afternoons, February 14 and 15, the sightseeing committee, under the direction of N. C. Catobish, sales manager of the National Carbon Company, will take the party of jobbers in automobiles to various points of interest about Cleveland, and special trips will be made to the plants of the National Carbon Company and the National Electric Lamp Association. This will offer the visiting jobbers a unique opportunity of getting in touch with the manufacture of carbon products entering into every phase of electrical work, and will also offer an opportunity for a close investigation and study of the great engineering institution and organization conducted by the National Electric Lamp Association for the development of the manufacture of incandescent lamps.

Under the direction of J. Robert Crouse, chairman of the finance committee, a big fund has been raised by the electrical interests of Cleveland so that nothing is now in the way of making this the most satisfactory and inspiring convention the Electrical Supply Jobbers' Association has ever held.

The headquarters of the Association will be established at the Hollenden hotel, and the meetings will be held in one of the large reception rooms. The Electrical League of Cleveland will establish headquarters at the hotel, and immediately upon arrival it is expected that every electrical man will register at the League headquarters, receive his identification badge and invitations to the various entertainment features.

Supply Men and Their Interests.

LeRoy Mills, of the Mills Electric Company, Peoria, Ill., is manager of the Peoria Show Association, and this hustling young supply man is making a big effort to make the show a very complete representation of electrical equipment for domestic and industrial applications. The show will be held in the Coliseum, January 22 to 27. Mr. Mills was in Chicago last week, after making quite an extensive trip, and reports that the reservations of space and the interest manifested indicate a very successful outcome of the efforts of himself and the other promoters of the exhibition.

The Post-Glover Electric Company, Cincinnati, Ohio, is ably represented by Perry VanWinkle, who is conceded to be one of the most genial men in the business. Perry travels a good deal and attaches to himself through a mighty pleasing personality a host of friends wherever he goes.

The Bissell Company, Toledo, Ohio, has one of the best display rooms in the country. Located on one of the main thoroughfares, in the busy down-town district, this company's store is a commendable example of what can be accomplished in the way of displaying electrical merchandise. The company covers a big territory and its counter sales are very heavy, special attention being given to this part of the business. The Bissell brothers, Fred and Walter S., are highly esteemed and very popular among the electrical fraternity.

Meeting of Quaker Jovians.

A meeting of the Sons of Jove in the City of Brotherly Love was held on January 4, at which an address was made by Philip S. Dodd. He gave his hearers a great deal of valuable information along commercial lines.

The rejuvenation which had been planned for January 26 has been postponed until February 2.

The Philadelphia Jovians intend to send a party to attend the New York rejuvenation on February 7.

At the luncheon of the Jovian Electrical League on January 11 an address was made upon the subject "Co-operation" by E. J. Berlet, president of the Business Science Club.

Legal Notes

DUTY, IN STRINGING ELECTRIC WIRES, TO GUARD AGAINST DANGER TO CHILDREN.

By Maguire & Mooney.

The law does not require of children the same care in the prevention of injury to themselves that is expected of an adult. It is necessary for a public-utility company to see that its wires may not be brought in contact with curious or reckless persons. This article presents a number of cases showing how this general principle has been interpreted in the courts.

As to the duty to guard against danger to children in placing electric wires, no rule can be enunciated that would be accepted by all courts. But the general rule requires that those dealing with such an extremely dangerous agency as electricity should, in stringing their wires in places where it is reasonably probable that children will go, be charged with the very highest degree of skill and care to protect the children from injury while in the vicinity of such places, even though they may have no business in that vicinity.

In accordance with this rule the case of Pierce vs. United Gas & Electric Company, 118 Pac., 700, was so decided. Albert and Walter Pierce were 13 and 11 years old respectively. They were ordinarily bright and capable, obedient and industrious. The company was furnishing light in San Jose and it carried a line of wires along the Alameda to Santa Clara. The voltage was between 2,200 and 2,500. On one pole the company maintained a guy wire that reached from the apex of the pole to a tree about 40 feet away. The guy wire had become detached from the tree about two weeks before the accident and its surplus length lay upon the ground. As it so hung no current traveled through it. Some boys in the neighborhood, noticing the free wire, began playing with it and several of them pulled it out into the street, drew it taut against the feed wire and received slight shocks. Encouraged by this sport, Albert Pierce took it and drew it taut and was instantly killed. His brother, Walter, seeing the accident, ran to his rescue and was similarly shocked and killed. The court held that the guy wire, so placed, was such as would attract children and lead them to play with it. The company, with reasonable care, could have known of the condition of the wire.

In the Consolidated Electric Light & Power Company vs. Healy, 65 Kansas, 798, for the death of a boy about ten years of age, the court declared that dangerous attractive objects should be so guarded that children could in no way receive injury. The company laid a series of wires on a viaduct of a city street, outside, but close to, the traveled way. Through constant service the wires had become defectively insulated. The boys of the neighborhood were in the habit of climbing up and over the viaduct, and the Healy boy was killed by an uninsulated wire coming in contact with his body. The lack of intelligence, discretion and caution which is exhibited in children must be guarded against by the company, and attractive nuisances render the keeper culpable.

The proposition is based almost solely on the attractiveness of the dangerous object. If there is no attraction for the child there is no liability against the company, unless the company has been negligent in placing wires where no amount of care or caution will prevent an injury. This has arisen through the ideas that children are licensed to go wherever they can find that which is attractive. Children of tender years cannot be trespassers, and accordingly an allurement might induce them to go upon private premises.

Before liability can arise the injury must be intentional on the part of the company, or it must be wanton, or an invitation must be extended by the company to the injured person. That invitation may be an actual invitation or it may be implied from circumstances.

The question of age and intelligence of the child has a great deal to do with the liability of the company. The boy may be city bred, acquainted with the effects of an electric current, and as well acquainted with its use as the ordinary adult. In such a case the attractiveness of the wires would either not appeal to him as a source of play, or if it did and he was injured he could recover nothing. In Johnston vs. New Omaha Thomson-Houston Electric Light Company, 78 Neb., 24, recovery was denied for injury to a bright, intelligent boy twelve years old, living in a city in which electric light and power wires were in constant use in nearly all of the principal streets and highways. The boy climbed up on a fence about four feet in height in order to grasp an electric light wire about two feet above the top of the fence in order to see if he could get a shock. The court held that such was not an attraction that would allure children, and even though the wire may have been insufficiently insulated, yet the intelligence of the boy should have prevented him from causing himself injury.

Where the company maintains a system whereby its wires pass through trees, injury may often result to children who climb about in the trees. Most of the courts of the country recognize the fact that a tree is an attraction—that children are prone to climb trees—and they have enacted the rule that the highest degree of care practicable must be exercised by the company to prevent injury to children who are climbing about in trees. In Michigan, however, the court has held that a company was not bound to anticipate that a child would climb up six feet and grasp an uninsulated wire, and therefore held the company was not liable. But this was not an injury caused by the child climbing a tree. The Washington Water Power Company had constructed a series of wires over the Spokane River. These wires were uninsulated, but they were placed about 30 feet above the ground near a bridge pier, which was not intended to be climbed. One Graves, a boy fifteen years old, climbed up the lattice work, formed by braces on the pier, and received a severe shock by contact with the uninsulated wires. The court said that such a structure was not attractive and that the boy had no business in climbing up the pier. When wires are placed in close proximity to places where children may rightfully go for business or pleasure, it is incumbent upon the company to use a high degree of care in insulating the wires. Graves

vs. Washington Water Power Company, 87 Pac., 956.

Excavations as Attractions to Children.

A great deal of litigation arises from injuries received by children caused by falling into or jumping into excavations or holes. In Secard vs. Rhinelander Lighting Company, 133 N. W. Rep., 45, the company had made several excavations in the streets, about five feet deep and 20 inches in diameter at the top. Poles were to be put in these excavations, but after the excavation had been completed the holes were left wholly unguarded. A child, about ten years old, was playing around on the sidewalk, and as she was attempting to jump across one of the holes the earth caved in, throwing her forward into the hole, suffocating her. The girl had been admonished by an older sister not to play around the hole and the company brought this forward to show that she was negligently careless. The court held that the child had used ordinary care for its own safety —the child knew the dangers attendant to jumping over the hole, but the child did not and could not know of the likelihood of the earth caving in. A verdict of $1,500 was affirmed. The company, in protecting the general public, should look forward to the protection of the smallest child or the mentally weak. By circumscribing these classes the rest of the general public is included, and their protection is secured. Excavations on private property may cause injury to children, yet they are not of such an attraction that the owner of the property must guard it to prevent injury to children who may come in without his invitation. But excavations in the highway or public streets must be guarded, especially if they are in such close proximity to to the sidewalk that even an adult might step in and be injured. To children a hole in a street is about the best sort of an attraction they could desire, and in playing about it they cannot be accused of being trespassers because they are playing on a public street and not on private property.

Excavations or holes in alleyways come in for consideration also. In Briscoe vs. Henderson Lighting & Power Company, 148 S. C., 396, the company maintained a power station and engine room fronting on Spring Street in Henderson, S. C. The part of the frontage not covered by the power station was occupied with the manager's residence and by an alleyway, the alleyway cutting the manager's residence from the station. In this alleyway the company had three wells, usually full of hot water. Briscoe, a boy of thirteen, went through the alley and fell into one of the wells and was injured. The attorneys for the boy contended that the power station, being equipped with engines and machines and the building being constructed with large windows, was an attraction to a boy of thirteen and in his search for information or in a desire to satisfy his curiosity he was impliedly invited to see the operation of the plant. The alleyway was not a public street, it was the property of the company. The court declared that it would be an imposition to require owners of lots in towns to guard every pathway or alley used for their own convenience against the intrusion of trespassers. No duty can be imposed upon an owner or an occupant to keep his premises in a suitable condition for those who come for their own convenience or pleasure, and who are not either expressly invited to enter or induced to come upon them by the purpose for which the premises are occupied. A boy over ten years of age is presumed to have sufficient discretion and caution to be able to protect himself in the ordinary affairs of his daily life. When an excavation is so made that it adjoins a public highway a greater degree of care is required, because a false step or a sudden giddiness will precipitate the person walking near it into the hole and injure him. But when the excavation is some distance away from the highway the case is different. The court also said that the machinery was not of sufficient allurement to attract a thirteen-year-old boy into the premises, because there was no evidence that other boys had been attracted to the building. And, accordingly, the court held the boy was not entitled to recover.

In Missouri these cases would devolve on the question as to whether the child's own act had caused the injury. Undoubtedly if the girl had not jumped up and down and jarred loose the earth, the earth would not have become loose and she would not have been thrown forward into the hole. In the same manner the Missouri courts would have decided that it was the child's own act that caused the injury in falling into the well. A child of thirteen years should use the intelligence and knowledge of matters in general in such a way that a certain degree of care for its own safety will be exercised.

Interesting Cases.

WHAT IS INCLUDED IN A "LINE."—Where there was a grant for a telephone line within and through a city, the United States Circuit Court of Appeals, Eighth Circuit, holds that it could not fairly be said that the expression "telephone line" in the grant restricted it to a through line. This language is equally appropriate to a telephone exchange. No reasonable support can be found for such an interpretation of the word "line" when used in such expressions as telephone or telegraph line as would confine it to a single through line, instead of a local exchange, in the case of a telephone line. In popular language the word has a generic meaning. We get the true significance in such phrases as "Great Northern Railway Line," "Northwestern Line," etc.—City of Vermillion vs. Northwestern Telephone Exchange Company, 180 Fed. R. 289.

LIMITATIONS OF FRANCHISE PERIODS.—Under the provision of the constitution of South Dakota that "No telephone line shall be constructed within the limits of any village, town or city, without the consent of its local authorities," the United States Circuit Court of Appeals, Eighth Circuit, holds that the city of Vermillion was vested with an absolute discretion as to the terms upon which it would give its consent. A limitation of the period for which the privilege should be enjoyed was not only within the provision of the constitution, but was also justified by the highest wisdom as a proper protection of the rights of the city in its streets. Such limitations are at the present time a prominent feature of sound municipal action. This has been the uniform interpretation of similar constitutional provisions.—City of Vermillion vs. Northwestern Telephone Exchange Company, 189 Fed. R. 289.

CANNOT BE COMPELLED TO FURNISH FREE LAMPS.—The Supreme Court of California holds void a city ordinance requiring any one supplying electric current for lighting purposes to furnish free incandescent lamps. The court says that no one can seriously assert that the furnishing of incandescent lamps is a part of the duty of a quasi-public corporation supplying electricity for light or power. The public duty of such a corporation is fully performed when it has brought its commodity safely and conveniently to the door of the consumer. Within that door the company is not by law obliged, and may not by law be compelled, to go for any purpose foreign to the public service it is called upon to render, and that the purpose here contemplated is foreign is abundantly established. If the city council in its rate-fixing ordinance made an allowance because of the gifts which the companies were making to their consumers, it was a very improper thing for it to do. The council has no right to recognize and allow for gifts, donations, or charitable bestowals made by public-service corporations, however commendable from the ethical point of view these things may be.—Ex parte Goodrich, 117 Pac. R. 451

Public Service Commissions

NEW YORK.

In its annual report to the Legislature, the Public Service Commission, First District, asked for an amendment of the rapid-transit laws to provide that reorganized companies must have the Commission's approval to issue new securities, as is now provided for with solvent companies. The recommendation is the outcome of the recent decision of the Court of Appeals that the approval of the Commission was not needed by the reorganized Third Avenue Company.

The Commission reports that there are now ninety-seven operating and lessor transportation corporations in Greater New York, with an aggregate capitalization of $1,124,342,471. The number of passengers carried in a year on the surface, elevated and subway lines has grown from 1,358,000,407 in 1908 to 1,603,908,253 in 1911. In the same time the total operating revenues of the same companies have increased from $69,026,613 to $83,751,414.

During the year the commission tested 609 electric meters against which complaint had been made.

A comprehensive review of the operation and existing conditions of upward of one thousand corporations, carrying a capitalization of $4,517,718,440, under the supervision of the Public Service Commission, Second District, is given in the fifth annual report of the Commission.

Attention is called to the very healthy growth in the total operating revenues in the Second District, of electric street railroads. In 1907 such total was $19,293,052, and in 1911, $26,979,399. The net revenues from railroad operations during the same period have increased from $6,821,197 to $10,285,682, or 50 per cent.

For the 50 larger companies selling electricity exclusively the operating income, that is, the gross operating revenues, less expenses and taxes, for the year ended December 31, 1910, showed an increase of 28.7 per cent over the preceding year. For the thirty-nine larger companies selling both electricity and gas there was an increase in the corresponding period of 24.6 per cent, while for the fifteen larger companies selling gas only there was an increase of 21.7 per cent.

The report shows that among electric railroad, electrical, and gas corporations, 117 are now paying dividends as against 82 in 1910, and 73 in 1909.

Street Railroads.

During the year 42 street railroads were inspected as to physical condition, methods of operation, and equipment. The mileage of electric railroads in the district is 2,722.38.

Electrical Corporations.

The report makes a departure this year in citing specifically instances in which the Commission found it advisable to proceed summarily against gas and electrical corporations in matters urgently affecting the security of the public, non-compliance with the law, or disregard of recommendations informally made by the Commission respecting conditions which obviously should be corrected.

The system of electric meter testing and inspection which has been continued during the year includes (1) laboratory tests of various types of electric meters to ascertain their ability to maintain reasonably close accuracy under usual operating conditions; (2) tests of electric meters on the complaint of consumers and on their premises; (3) frequent tests of the instruments used by corporations and municipalities in testing their consumers' meters; and (4) a general supervision of the methods of meter testing and installation employed by the corporations, which includes the filing of monthly meter reports showing the condition of such meters as were tested.

Station testing standards owned and in use by the companies were tested as follows: 900 rotating standards; 227 indicating wattmeters; 119 voltmeters; 72 ammeters; total 1,318. Of this total, 1,291 were approved as accurate, 27 were disapproved and ordered readjusted; and 49 were re-calibrated by the inspectors.

This year, 87,893 consumers' meters were tested by the companies, which is 3,317 more than were tested last year, and 9,777 more than were tested in 1909. A percentage of fast meters to the total of 9.5 per cent was found in 1909; 7.4 per cent in 1910; 5.6 per cent in 1911. The percentage of correct meters for these years was 69.9 per cent, 75.2 per cent, and 79.8 per cent, respectively. These comparative figures show that the Commission's system of inspection is bringing about a gradual improvement in the accuracy of registration of consumers' electric meters.

By amendment of the law of 1910, electrical corporations were prohibited from installing any meter the type of which shall not have been approved by the Commission. The electrical laboratory was further equipped for this special work and tests have been completed upon all types of electric meters except the several types of induction meters. Information given by the companies shows that there are over 166,000 electric meters in use in the second public service district, comprising some thirty different types.

Proceedings have been begun requiring all companies and municipalities owning or maintaining pole systems carrying telephone, telegraph or electric lines, to number the poles in such manner that the ownership may be readily ascertained by the Commission's inspectors.

Municipal Plants.

The Commission calls attention to the conduct of municipal lighting plants which are operated in two cities and forty-eight villages of the State. It is stated that such municipal plants are, with a few commendable exceptions, unable or unwilling to adopt practices of modern accounting and in many instances the bookkeeping is limited to a record of consumers' accounts and a simple statement of receipts and disbursements with little or no attempt at analysis or classification. In some cases the affairs of the lighting plants are so inter-related to those of water or some other departments and the accounts of the two departments are so confused that it is impossible to determine the actual results of the operation of either department. The Commission remarks that it is a matter of supreme importance, when municipalities embark upon business enterprises, that they should adopt businesslike methods. The citizens of many a village are convinced that their lighting service is cheap, when as a matter of fact it is dear, because the lack of a proper accounting system fails to reveal the actual conditions. The Commission finds it is without

sufficient force to teach the elementary rules of accounting to the administrative officers of these municipal lighting plants, but it is making a serious effort to accomplish complete and accurate accounting in municipal as well as in privately managed business enterprises, and to show that the extra work and the extra expense incurred will be more than compensated for by the greater knowledge of the business and the economies which can be effected thereby.

Telephone Companies.

Attention is called to the exemption of telephone companies having property of less than $10,000 in value which do not come within the jurisdiction of the Commission. The Commission has no power to make an examination of a company which claims to be without its jurisdiction. The Commission says that beyond question there are several hundred telephone corporations within the state which should not be subject to the supervision and jurisdiction of the Commission, but the Commission should have sufficient power to ascertain its jurisdiction and to close the door to those evils which will in time inevitably spring up from the legal permission to authorize companies with less than $10,000 of property which will ultimately acquire property above the jurisdictional point without knowledge or authorization of the Commission.

Further attention is called to the fact that under the law as it stands the stock of one telephone corporation can be purchased by another without application to or authorization by the Commission, or local plants may be transferred in the same manner. Companies in most cases can be consolidated or merged in precisely the same manner as before telephone companies were placed under the jurisdiction of the Commission.

WISCONSIN.

The Wisconsin Commission has approved the application of the La Crosse Gas and Electric Company for authority to issue $1,100,000 par value of bonds, to be secured by a mortgage upon all property of the company. The bonds are to bear interest at a rate not to exceed 5.5 per cent per annum. They are to be issued in exchange for the outstanding bonds of the Wisconsin Light and Power Company, and an outstanding bond issue of the applicant in the amount of $600,000.

The Beloit Water, Gas and Electric Company has been authorized to issue $900,000 par value of five-per-cent bonds to be secured by a trust deed constituting a first lien upon all the possessions of the corporation. The total issue eventually to be secured by this deed of trust is $3,000,000, of which only the above sum has so far been authorized by the Commission. According to the terms of the certificates of authority, the trust deed must contain a provision that none of the bonds except the $900,000 now authorized, are to be released by the trustees except for improvements or additions to the property and then only to the amount of 80 per cent of the cost of the new construction, and provided further that the net earnings of the corporation for the previous twelve months shall equal or exceed twice the interest charges on the amount of bonds then outstanding and those to be issued for the new construction. After January 1, 1915, the corporation must annually pay over to the trustee a sinking fund amounting to one per cent of the principal of the bonds outstanding at the time of payment. The $900,000 of bonds now authorized is to be used to retire securities of the Beloit Water Works Company, the Beloit Gas Light and Coke Company, and the Beloit Water, Gas and Electric Company.

In the event of the amendment of its articles of association so that it may have corporate power to do so, the Commission has authorized the Beloit Water, Gas and Electric Company to issue $500,000 par value of seven-per-cent cumulative preferred stock, of which $100,000 is to be exchanged for a like amount of six-per-cent stock now outstanding, and the remainder used to pay the remaining $400,000 now outstanding on construction notes.

NEW JERSEY.

The Board of Public Utility Commissioners has granted certificates of approval for the issue of securities by the Stone Harbor Electric Light and Power Company to the amount of $58,700 in bonds and $21,000 of stock.

Hearings were held during the week at Trenton and at Jersey City in the investigation of the rates of the Public Service Electric Company and the telephone complaints against the New York Telephone Company and the West Jersey Toll Line Company.

INDIANA.

The Railroad Commission of Indiana, whose duty it is to keep informed as to the condition of railroads with reference to the security of the public, is advised that the steel now manufactured and put in on the steam and interurban railroads in the State is inferior to the lighter grades heretofore used. There being a difference of opinion between manufacturers and carriers as to whether this steel should be still heavier to sustain heavier equipment and loads, or should be of such better quality as were said lighter grades, the Commission has called a conference of general managers, superintendents, engineers in charge of maintenance of way, expert testers of steel, manufacturers and roadmasters on February 8 to consider the matter with a view of securing for use on the railroads of Indiana a high grade of steel.

GEORGIA.

The Georgia Railroad Commission, on a rehearing, has approved the issue of the entire $27,000,000 Georgia Railway & Power Company stock, in accordance with that company's original application.

Electrical Exports for November.

The Bureau of Statistics of the Department of Commerce and Labor, Washington, D. C., has issued its monthly summary of imports and exports of the United States for the month of November, 1911. From these statistics the following data relative to the exports of electrical products are obtained.

Both as to appliance and machinery exports these figures show a material improvement during the month in question over the preceding month and the corresponding month last year, as shown by the comparative monthly data below:

Month	Electrical Appliances	Electrical Machinery	Total
Nov., 1911	$955,706	$723,860	$1,679,566
Oct., 1911	851,650	583,000	1,434,650
Nov., 1910	884,326	612,007	1,496,333

A summary of the principal countries to which electrical products were sent last November, together with the value of these shipments is given in the following table:

Countries.	Electrical Appliances	Electrical Machinery
United Kingdom	$127,313	$ 44,191
Canada	280,775	192,140
Mexico	69,725	104,933
Cuba	44,392	61,740
Brazil	143,214	78,876
Japan	25,061	25,677

Public Utility Commissions to be Discussed in Chicago.

At the next joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, the well known public-utility expert, William J. Hagenah, will make an address entitled "Public Service Commissions." The meeting, as usual, will be held in the rooms of the Western Society of Engineers, Monadnock Block, Chicago. The date is Monday evening, January 22.

At the last meeting of the Electrical Section of the Society the following officers were elected for the ensuing year: P. B. Woodworth, chairman; James Lyman, vice-chairman; G. T. Seely, member of executive committee.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 38.—Wound Rotor for Induction Motor.—How is the rotor of a three-phase induction motor wound so as to have only two slip rings? I recently saw one whose speed can be regulated by changing grid resistances in series with the rotor, but it had only two slip rings, whereas I think it should require three.—D. T., Highland Park, Ill.

No. 40.—Selective Parallel Operation of Door Bells.—It is desired to have three bells connected in multiple and rung together from one push-button at the front door; it is also desired to have a push-button at the side door to ring two of the bells but not the third. A physician says he had this arrangement operating for several years, but carpenters in making some repairs destroyed the wiring; now he wishes it restored. How is it done?—C. A. W., Peterboro, N. H.

No. 41.—Commutator Trouble on Elevator Motor.—We have had some trouble with an elevator motor. My employer claims it was caused by lack of care, but I contend that the mica under the commutator bars was defective. Two adjoining commutator bars melted the solder holding the wires in them, but there were no other markings and the mica between them was not burned on the outside. Two weeks later a bar on each side of the first two acted in the same way. The elevator ran for a while with the solder partly melted from the four bars. Could this trouble have been prevented by better care of the brushes and commutator, or is it due to defective insulation under and around the commutator parts?—G. S. M., Kansas City, Mo.

No. 42.—Voltage Control for Low-Voltage Direct-Current Sign Lamps.—We have a direct-current sign containing 700 twelve-volt, five-watt, tungsten sign lamps wired ten in series on 110 volts. Frequently the voltage boosts up too high and burns out quite a few lamps. Is there a regulator we could use on the main 110-volt circuit to keep the voltage down to a safe value for these five-watt lamps?—A. J. D., Chicago.

No. 43.—Safe Use of Disconnecting Switches.—Is it ever safe to open a disconnecting switch on 4,000 volts while the circuit is still alive? A friend of mine recently had his arm badly burned while hastily pulling such a switch in order to save a fellow workman from danger. He did not have time to get to the oil switch.—J. E. N., Pittsburgh, Pa.

Answers.

No. 36.—Waves of Magnetic Induction and Electromotive Force.—If I am given the shape of the electromotive-force wave of a certain alternator, expressed in terms of a sine series, and am required to find the shape of the wave of magnetic induction that the given electromotive force will produce in the iron core of a static transformer, the constants of which are known (including the hysteresis loss for any range), how shall I proceed? I understand that I can find the induced electromotive force in the secondary by differentiating the equation of the flux, but the several treatises which I have consulted fail to show me conclusively how the wave of magnetic induction is obtained from the applied electromotive force when this applied electromotive force is not sinusoidal.—M. S., Atlanta, Ga.

The total electromotive force applied to a transformer may be divided into two parts, one of which is balanced by the counter electromotive force, while the other serves to produce a flow of current. The counter electromotive force, which is the electromotive force induced by the changing magnetic flux in the core, has a shape which can be determined by the differentiation of the equation which represents the wave of magnetic flux, or conversely, if the shape of the electromotive force wave be known, the shape of the wave of magnetic flux may be obtained by integration. The exciting current of the transformer has a wave shape which depends upon the permeability of the core and the hysteresis, and the magnitude of the electromotive force producing this current will depend upon the resistance of the primary winding. Under no load this electromotive force is usually negligible, and the shape of the wave of magnetic flux could be secured with sufficient approximation by disregarding it. With a heavy load, however, when the primary copper loss becomes appreciable, this component of the total electromotive force becomes more important, and will slightly modify the shape of the wave of magnetic flux. If the necessary data are at hand the shape of the wave may be determined by a graphical method, but it is very difficult to work it out mathematically for a general case. The matter would probably be made more clear by a perusal of Technical Papers Nos. 87 and 116, issued by the Bureau of Standards, Washington, D. C.—E. R., Washington, D. C.

No. 37.—Time Switch for Street Lighting Circuits.—Can a time switch mounted in a box on a pole be depended on to close and open a remote circuit for ornamental street lighting that is supplied in multiple from the regular 110-volt mains?—H. W., Battle Creek, Mich.

A good time switch will completely fill the bill for the work referred to. If wound and incidentally inspected once a week it can be depended on to give entire satisfaction. Many companies have a man go the rounds and turn on each lamp cluster and again turn them off at midnight. This always struck me as a relic of gas-lighting days when it was necessary to have a goodly number of lamp-lighters. I have seen many time switches knock the spots out of this old fashioned custom and am surprised they are not more generally used. I would not advise using a cheap time switch, however. The cost of a good time switch will be made up in a few months at the most. If it is necessary to have a man patrol a district to see that the lights are burning all right, he can do so best on a motorcycle; one man can handle an enormous district in this way, whereas, if lamp-lighters are employed, it will take ten to twenty times as much labor. The time switches I have in mind are mounted in locked waterproof cases that entirely exclude moisture and prevent tampering.—J. T. E., St. Louis, Mo.

No. 39.—Sparking Between Gas and Water Pipes in an Uncompleted House.—(See query by A. K. Brake on page 88 in the issue of January 13, 1912.)

The cause of the sparks, referred to by A. K. Brake, in the January 13 issue of the Electrical Review and Western Electrician was no doubt due to a difference of potential between the gas system and the waterworks system which were both carrying stray railway return current at this point. We had a similar experience in Rochester, N. Y., where there was a continued sparking between the conduit pipes in the building and the gas pipes. The conduit pipes were, of course, grounded to the water system as is the Underwriters' rule. This was traced out to be railway return current, although it was not to be wondered at in this case, as the building was near a power station to which the railway return was inadequate. It has been my experience in making electrolysis tests to find a difference of potential between gas and water mains of from a few tenths to several volts and of current varying from zero to as high as one hundred amperes. Of course, this all depends upon the time of day and railway load, bonding of the rails, bonding between the rails and pipes and any direct connection between the gas and water systems as the case of gas water heaters which directly connect both gas and water pipes together.—G. B. S., Rochester, N. Y.

Wind-Driven Wireless Stations in the West Indies.

Wireless stations operated by wind power are proving a success on the Island of Curacao. There is a central station at Curacao, with a reach ordinarily of about 300 miles, and one of smaller power on each of the islands of Bonaire and Aruba. A gasoline engine is held in reserve.

ISOLATED PLANTS.

Monthly Meeting of the American Institute of Electrical Engineers.

The 267th meeting of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York City, on the evening of January 12. The meeting was called to order by Vice-President D. B. Rushmore. The paper of the evening was by Percival R. Moses and was entitled "Some Notes On Isolated Plants." An abstract of this paper follows.

The author gave some figures showing the extent and importance of isolated plants as compared to central stations. The design of an isolated plant is seldom given the benefit of a sufficient study of the facts. There has not been sufficient interchange of data between small plants; operating engineers are usually too busy or too fearful to publish their results. It has been equally difficult to get accurate records of loads, since few plants keep regular logs. In his own work the author has endeavored to keep regular records from which reliable data could be obtained. Isolated plants vary in complexity from a mere oil engine or water wheel to a complete equipment of boilers, engines, dynamos, switchboard, refrigerating machinery, elevators, pumps and heating, ventilating and other machinery. In discussing design it is impossible to confine the investigation to the electric plant alone. This is only a small part of the work of the plant. The different parts are interdependent, and several diagrams were given showing how the layout of the entire plant was dependent upon a few definite requisites. The heating design, the electric supply, the refrigerating plant, the type of elevator, etc., has each its influence upon the design of the other elements of the plant. A specific instance showing this interdependence was given. The two main features frequently included in design are compactness and simplicity. All the machinery, except the boilers, should, when possible, be placed in one room, and be under the direct observation of the engineer. The unavoidable complexity of modern equipment makes the utmost simplicity in design necessary. Overall efficiency must be considered for the whole plant. High efficiency in the elements does not necessitate an efficient plant, and an inefficient electrical system does not necessitate low overall efficiency, as for instance, when the heating and refrigerating plants absorb the waste energy. Figures were given for the cost of fuel and labor for heating a number of typical buildings without private electric plants, and for hotels with their own electric plants. Curves of electric load were also given for a variety of buildings, and also figures for the total kilowatt-hours consumption. The maximum electric demand is often overestimated from ignorance of the diversity-factor.

Experience enables one to determine in advance within 15 per cent what the maximum load will be for a given size and type of building. The load curves were plotted from hourly instrument readings as noted on log sheets. The characteristics of the load curves for different types of buildings were discussed in reference to using these as a basis for design. The author gave his conclusions regarding the type of plant most desirable for different types of buildings. The choice of a prime mover must be governed by other factors in the plant. Where heating is a negligible item, the choice is governed by the balance between investment and efficiency. Where steam is not required for other purposes, the author favored the producer gas engine and the oil engine, which he had found to give good service with high efficiency. Figures for kilowatt-hour costs excluding fixed charges were given for a variety of buildings. The cost per kilowatt capacity of the different items of plant were given in a table based upon the author's personal experience in New York City.

The discussion was opened by R. P. Bolton, who criticised the paper severely for what it did not contain. He said that the data given were of a very general character and were insufficient to compare the efficiency of different plants, or to base the plans for future plants. He drew attention to some of the features which the author had introduced as being of an informative nature and suitable for basing details of practice, but did not consider that the considerations upon which the general design were based, as given in the table by Mr. Moses, were sufficient to determine the general nature of the plant design. He condemned the practice of not giving the name and location of the plants which were described. He further considered many of the illustrations given as far from typical, and he considered the conclusions misleading on account of the irregular hours of service in an isolated plant. He quoted figures to show that the load-factors of many isolated plants are exceedingly low, quoting in particular the figures for the Trinity Building in New York. He found fault with the log record sheets submitted by the author for not giving sufficient information.

President Gano Dunn then took the chair and explained that the omission of the names of the buildings in isolated plants referred to by the author was due to the Meetings and Papers Committee. The names had originally been inserted in the paper by the author, but had been removed by the Committee, according to a general rule of the Institute.

John C. Parker approved the treatment of the isolated plants as a whole, a practice which was entirely too rare. He considered the figures given by the author for fuel consumption based on the size and superficial area as having little value since local variations, the percentage of glass in the walls, and many other factors, produce large variations in such figures, and the detailed conditions must be known in order to make the figures applicable. He thought it would have been much prefferable if Mr. Moses had put his results into formulas, so that definite factors could be used to represent his results. He thought the figures for the investment cost of $90 to $125 per kilowatt were too low, and considered this perhaps due to the fact that the cost of the building to house the plant was not included, and that the overhead costs had probably also been omitted. He agreed with Mr. Moses that apparatus of the highest efficiency was not always desirable and illustrated this idea by giving detailed figures for a specific instance.

Arthur Williams was the next speaker and he gave a lengthy argument against the operation of isolated plant in preference to the purchase of central-station power. He attacked the figures given by Mr. Moses and quoted a number of instances in which saving could be been made by utilizing the service of a central station. He condemned the methods of consulting engineers in figuring the costs, because they almost invariably leave out some essential item which causes the figures to be misleading.

George W. Martin also questioned the customary methods of figuring the cost of operation in isolated plants. Depreciation is often not included and the methods of getting the other elements of cost are very crude.

Charles K. Nichols questioned the statement that absorption refrigerating plants could be run by exhaust steam unless abnormal back pressure were permitted. He quoted a case in which a plant had been designed for such operation, but had actually resorted to live steam in practice. He considered the figures given to show the cost of fuel and labor for heating in typical cases were valueless in estimating similar items for other buildings, since the important variables were not given. Buildings might have the same size, etc., as given by the author, and yet have totally different heating requirements. Moreover, the figures included the cost of producing steam for other purposes than heating the building. He thought the advocates of isolated plants generally overestimated the consumption of electric power in proposed buildings. The data given for the energy consumption in the author's examples were of no value in estimating probable consumption in other buildings because the author failed to mention such important items as whether the elevators were electrically driven, the character of the lighting, etc. He considered the figures given for the cost of generating electric cur-

rent as valueless because the elements of basic cost must be estimated.

John W. Lieb, Jr., thought it unfortunate that the Committee had omitted the means of identifying the plants from which data were given. He thought that an endeavor had been made in following the author's scheme, to unknowingly distort the natural application of electrically driven devices in order to increase or decrease the production of electrical energy in particular cases.

Percival R. Moses in closing the discussion endeavored to correct some of the misapprehensions which had been made of the figures given by him. His c s per kilowatt of capacity were not intended to give the cost of installing plants, but simply the cost of certain items which enter into the total cost of plants. He named the Middletown State Hospital as an instance of the practice of operating absorption refrigerating plants with the exhaust steam from the pumps. It is not objectionable that pumps should use a back pressure of 10 to 15 pounds per square inch. He, himself, had used the figures for heating and estimating the cost of new buildings, and found them very serviceable. He had hoped that the discussion would bring out other figures, but none had been given by the other speakers.

After the adjournment of the meeting a smoker was held in the Institute rooms.

Meeting of Board of Directors.

At the meeting of the Board of Directors held in the afternoon, F. L. Hutchinson, who has been acting secretary, was elected as secretary.

The Board decided to recommend to the membership the amendment to the constitution providing for an additional grade of membership.

Annual Meeting of the Western Society of Engineers.

The forty-second annual meeting and dinner of the Western Society of Engineers was held at the University Club, Chicago, on the evening of January 10. Directly after the dinner the meeting was opened by the reading of excerpts from the annual report of Secretary J. H. Warder. He reviewed the work of the Society for the year 1911, pointing out that its total membership has now grown to 1,139, its activities increased, its finances still further improved, its Journal published ten times a year instead of only six times, and its influence broadened in many ways.

The annual award of the Octave Chanute medals for the best papers presented in the preceding year in civil engineering, mechanical engineering and electrical engineering was made as follows: to C. K. Mohler for his paper on "Earth Pressures"; C. P. Berg for the paper on "Heat Treatment of High-Speed Tools"; H. B. Gear for the paper on "Diversity-Factor in the Distribution of Electric Light and Power."

O. P. Chamberlain, the retiring president, then made his farewell address in which he called attention to the value of having engineers occupy positions of executive power, as well as of responsibility. Much headway has been made in this line, but greater opportunities still await the engineer.

The announcement of the election of officers for 1912 was then made as follows: W. C. Armstrong, president; A. Bement, first vice-president; G. T. Seely, second vice-president; E. C. Shankland, third vice-president; A. Reichmann, treasurer. J. G. Giaver, trustee for three years.

Mr. Armstrong took the chair at this point. In a brief address he urged that engineering societies should devote themselves not only to the promotion of the engineering profession, but also the broader and more intelligent consideration of all social, political, industrial and economic problems that the engineer comes in contact with.

W. F. M. Goss, dean of the College of Engineering, University of Illinois, made an address on "Citizenship." He showed that the great development of methods of intercommunication between all parts of the country has broadened the friendly relations and sympathies of all its people. The engineer has made these ways of intercommunication possible. Very commonly, however, he has been so deeply engrossed in the technique and routine of his work that he has failed to take the interest in public affairs that is his duty. A very pleasant exception to this rule was the effective appeal to the State Legislature last year by the Western Society of Engineers on behalf of the University of Illinois. A way to overcome this narrowness and tendency to "grind" was to broaden technical education and, forunately, some efforts in this line are already being made.

Marcus Kavanagh, judge of the Cook County Superior Court, made the closing address. Taking the same topic as Dean Goss, he urged on engineers and the cultured public in general more active support in the street and impartial enforcement of the law. He pointed out the dangers to the community resulting from lack of interest, misplaced sentiment and neglect of public duties.

Wireless for Block Island.

A wireless station has been opened at Block Island, which was cut off from outside communication for several days because of a break in the cable. The old station built there several years ago will be again equipped.

Special Lighting for Saint Patrick's Cathedral.

In connection with the home-coming of Cardinal Farley, an extensive decoration of Saint Patrick's Cathedral, New York City, will be undertaken. It is expected to use more than 50,000 incandescent lamps for this purpose, and the steeple is now being wired. For the Fifth Avenue front alone 11,000 lamps and twenty miles of wire will be required. Details of the illumination have been worked out by Vice-President Murray of the New York Edison Company in consultation with the committee having the matter in charge.

Not only will there be the wonderful exterior illumination of St. Patrick's Cathedral, to celebrate the return of Cardinal Farley, but special lighting is being arranged for the interior. The whole lighting system will be radically changed and the illuminating engineers in charge are conducting photometric tests to show just what effect the various alterations will have. The final arrangement of the details depends on the outcome of these tests.

The first and most essential change is in the type of electric lamps. Forty-watt tungstens of thirty-two candlepower will replace the old-fashioned sixteen-candlepower carbon lamps now used. The total installation will be 2,100 lamps. The seven great chandeliers, of one hundred lamps each, will be lowered twenty feet. These fixtures are so high that this change will not be especially noticeable as an architectural feature, although it will alter greatly the lighting effect. Five of these chandeliers are in the nave and one is in each of the transepts. They are 130 feet above the floor, and are so heavy that the combined strength of four men is required to hold the pulley ropes during the lowering operation.

At the top of each column, in the body of the church, is a cluster of lights. As arranged at present, they are almost worthless as far as reading in the pews is concerned. Especial tests are now going on to determine the best method of placing them so that illumination will be thrown directly on the pews.

Additions will be made in the sanctuary illumination, changes to accentuate the beauty of the marble altar and reredos, but the altar itself will remain untouched. It is by means of lights concealed behind the piers that this part of the cathedral will be illuminated, while a chandelier will be placed over the vault where the archbishops are buried.

New Electrical and Mechanical Appliances

Westinghouse Water-Wheel-Driven Alternators.

The speeds of water-wheel-driven generators of a given capacity operating under different hydraulic conditions may vary so widely that a considerable range of speeds must be covered by a line of generators for this service. These conditions are entirely unlike those affecting engine-driven generators which are built for but a few fairly well standardized speeds. It is impossible, therefore, for the manufacturer to have a complete design for every combination of capacity, voltage and speed that may be required, and it is not good engineering practice to use one or two types of rotor construction for machines for the entire range of speed. The Westinghouse Electric & Manufacturing Company has consequently developed numerous types of rotor construction each one of which has been thoroughly tried out in service and is now standardized.

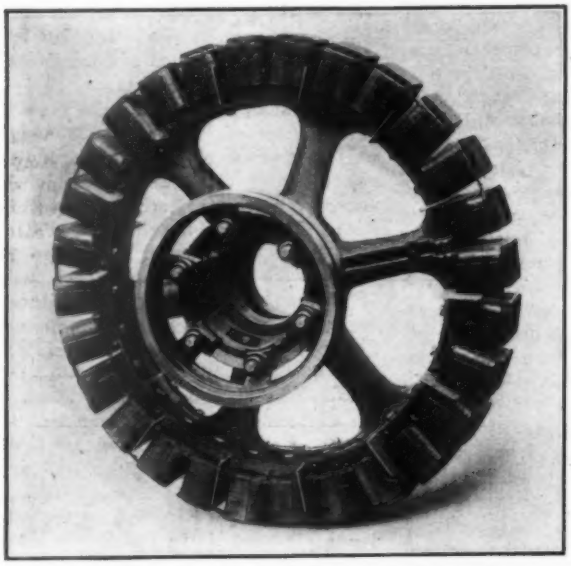


Fig. 1.—Completed Rotor With Cast-Iron Spider and Bolted Poles.

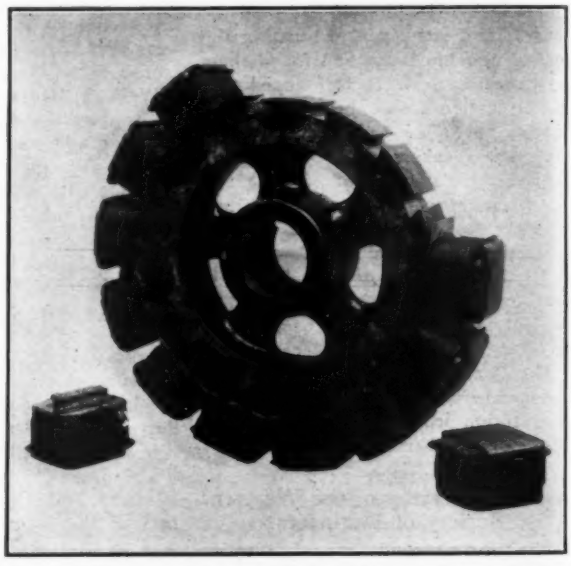


Fig. 2.—Rotor with Cast-Steel Spider and Dovetailed Poles.

In general the centrifugal stresses are very much higher in rotors turning at high peripheral speeds than in rotors turning at low pheripheral speeds. This condition was recognized by the Westinghouse Company in developing its several different forms of rotor construction. Each is inherently adapted for certain speed and capacity ranges, as indicated in the following summary of the principal types.

The construction shown in Fig. 1, in which the poles are bolted to the rim of a cast-iron or steel spider, is adapted for the lowest pheripheral speeds, such as ordinarily obtain with very low heads of water.

Fig. 2 shows a construction wherein poles are dovetailed to the rim of a cast spider, which is adapted for almost any speed, but is limited in its application because of the difficulty of promptly obtaining castings of large diameter. Cast-steel spiders are usually required for this construction.

In another construction, Fig. 3, adapted for rotors of large diameter and high speeds a laminated rim is dovetailed to a cast spider and the poles are dovetailed to the rim. This construction is adapted for large diameters and high speeds. A cast-steel spider would be satisfactory for these conditions provided the castings of the requisite diameter could be readily obtained. The use of such large castings is, if possible, avoided, as it may introduce delays in manufacture.

Rolled-steel plates form spiders of the construction shown in Fig. 4. The poles are dovetailed to the spider. This arrangement is adapted for the highest speeds. It is evident that it would not be possible to increase the strength of this construction, as the rolled steel is absolutely uniform in texture. It is, moreover, readily obtainable merchant material.

The poles for all these generators are laminated. The field coils are retained on the poles by overhanging pole tips, and, where the stresses are high, by extra coil supports riveted to the sides of the poles.

Cast-iron frames of modified box section, designed for maximum stiffness, support the punchings that form the armature structures of horizontal generators as shown in Fig. 5. Ventilating finger plates are inserted at intervals between the stator laminations to insure cool operation. End plates of cast or wrought iron bind the laminations firmly in position in the stator structure. All armature slots are open and all armature coils are form wound, thoroughly insulated and interchangeable. The armature coils are strongly braced at the ends of the frames, wherever necessary, so that they cannot distort under the action of excessive currents.

Open or ventilating end-bells are used on the smaller Westinghouse horizontal generators. These end-bells are built up from mild-steel sections and are rigid and unbreakable. At the same

time they are extremely open, assuring that cooling air currents will not be materially obstructed. Closed end-bells are successfully used on some of the large high-speed horizontal generators. These serve to direct the ventilating air effectively and to minimize the hum incidental to the operation of large, high-speed generating machines.

Westinghouse vertical generators are usually provided with two guide bearings. The bearings are babbit-lined and lubricated by a continuous flow of oil. The thrust bearing is ordinarily furnished by the water-wheel builder as a part of his equipment, but when the Westinghouse Company furnishes the thrust bearing, it is mounted on the top of the generator, as shown in Fig. 6. A mechanical or motor-driven rotary pump supplies forced lubrication for the vertical generators. A bed plate is provided with each generator which is set on the foundation; the generator is accurately alined, and then firmly clamped to this plate.

Standard Westinghouse water-wheel generators are regularly wound for any of the following voltages: 240, 480, 600, 1,200 and 2,400. Those of 500 kilowatts capacity and larger are also standardized for 6,600 volts. Two-phase or three-phase windings are standard. For single-phase service, generators are supplied having three-phase windings, only one phase being used.

Fig. 3.—Cast Rotor Spider With Laminated Rim.

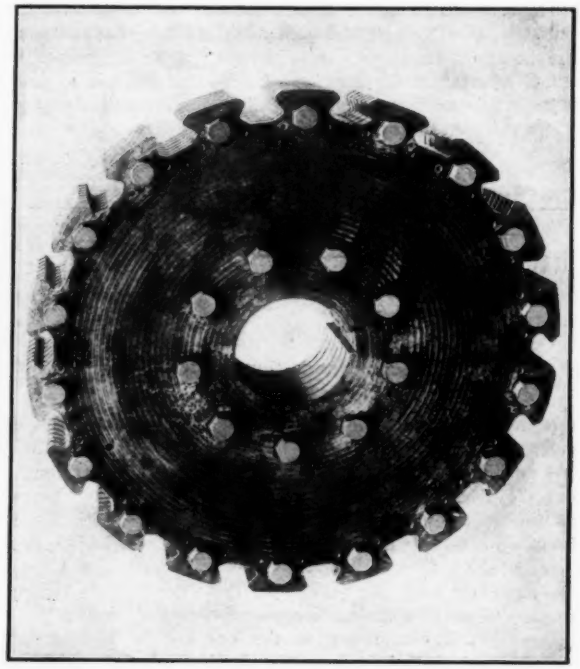


Fig. 4.—Rotor Constructed of Rolled-Steel Plates.

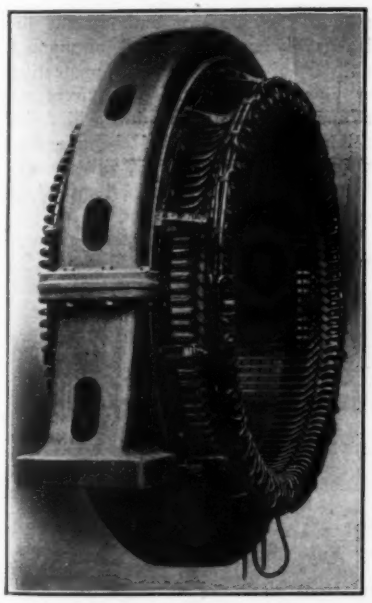


Fig. 5.—Stator Showing Armature Windings.

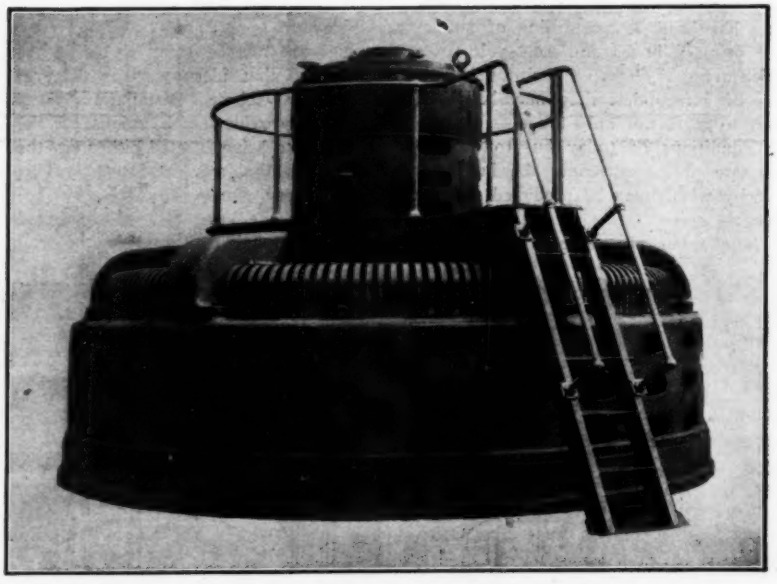
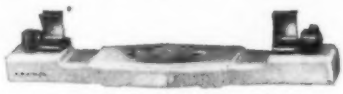


Fig. 6.—Vertical-Shaft Water-Wheel Alternator Complete.

Improved 2,500-Volt "Noark" Primary Fuses and Fuse Boxes.

With the invasion of electricity into suburban territory for light, heat and power, the central-station man or superintendent of distribution has been confronted with many problems. Some of these he has been able to solve on the ground, whereas in the solution of others he has found it necessary to call on the manufacturers of electrical apparatus to design devices to meet his particular requirements.

"Noark" Fuse With Knife-Blade Contacts.



Typical "Noark" Fuse Block.

"Noark" Fuse Carrier Handle.

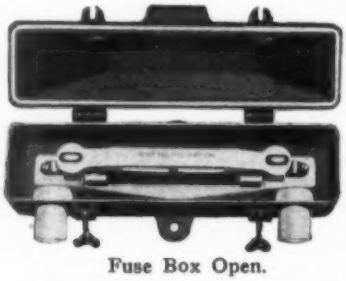
As an illustration of the point in question, the recent developments in 2,500-volt fuses and primary fuse boxes, by the H. W. Johns-Manville Company, New York, is cited.

It has long been the policy of this company to work in conjunction with the engineers of its customers, to the extent of securing all their suggestions and recommendations, together with a comprehensive statement of their requirements before projecting a new line of apparatus. After a careful study of the prevailing conditions and exhaustive tests on many of the largest aerial and underground systems in the country, the company has brought out a line of single-pole primary boxes and 2,500-volt fuses which are designed with such ample factors of safety that they may be relied upon to meet not only the most stringent conditions of today but to provide adequate protection under the increased severity which may be predicted for the years to come.

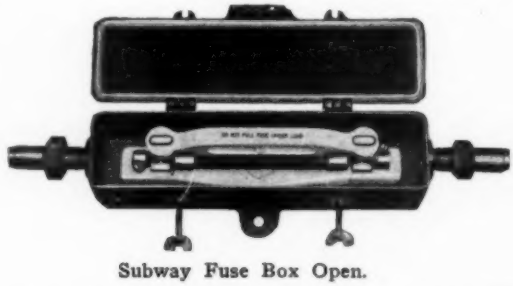
These boxes are made in three sizes, having maximum ampere capacities of 30, 60 and 100 amperes. A complete line of fuses is made for each size in amperages ranging from the maximum down to one-half ampere. This is a feature which will be warmly appreciated by the central-station man or superintendent of distribution, as it relieves him of the burden of replacing his fuse boxes with others of larger capacity as the load on his system increases, it being only necessary for him to estimate the maximum amperage that will ever be required at a particular installation, purchase the coresponding box and fuse it down to the proper point. As the load increases from time to time it will therefore only be necessary for him to change the fuses.

For aerial lines these boxes are provided with porcelain bushings of very liberal dimensions giving mechanical strength and abundant leakage surface. These bushings are located either on one side of the box or at the top and bottom, according to a consumer's system of connection. Several styles of feet or fastening lugs are offered electively as it has been found that ideas vary in this respect. For subway installation these boxes are provided with unions on the outlets, these being located either at the ends or on the side optionally. This union is very simple, consisting of but three parts: the brass cable-sleeve tinned to facilitate wiping a joint to the lead sheath of the cable; a male end screwing into the cast-iron box with a standard pipe thread, and a hexagonal nut or shell. The joint between the male end and the cable sleeve is accurately ground to a perfect fit, thereby securing absolute watertight properties without the use of a gasket of any form. All "Noark" primary boxes, whether for aerial or subway work, are equipped with doors hinged at the side and held closed by pivot studs and wing nuts against a tubular rubber gasket of high resiliency.

Fuse Box Closed.



Fuse Box Open.



Subway Fuse Box Open.

Interlocking Vitrified Tile Conduit for Underground Steam Pipes.

Ever since the idea of central-station heating was conceived and pipes were placed underground for conveying steam or hot water, the necessity for some compensating process for preserving and insulating the pipes has been conceded. Evans, Almirall & Company, New York and Chicago, have now succeeded in developing a patented interlocking vitrified tile conduit, in which, the company states, every conceivable objection to conduit construction for this purpose has been overcome. Substantially perfect insulation, attained by employing this method, renders it feasible to convey with little loss, any hot or cold liquids or gases (steam) at any temperature, for incredibly long distances.

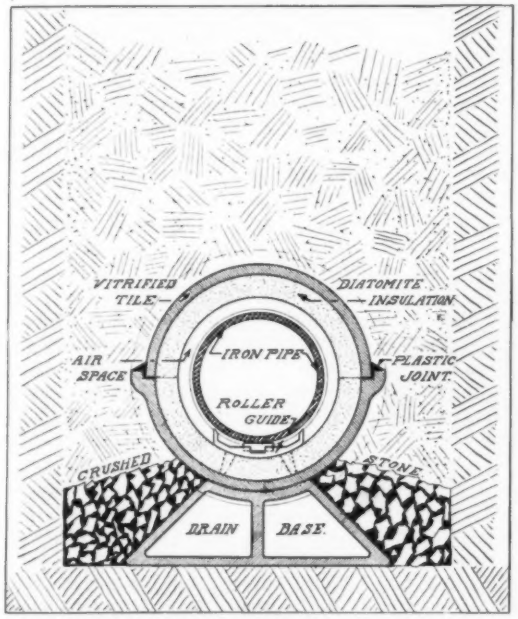
Underground conduits are of no value if they do not embody the indispensably necessary and permanent qualities of insulation and protection for pipes. Unless these requirements are met so that the conduit will resist moisture, acids, fire and the chemical action of the earth, water, and prevent electrolysis, the design is deprived of its usefulness.

The salient features of the new system are the tile casing, diatomite insulation, and the interlocking drain base. The interlocking features, by which the sections of the tile casing and the base are tied together, make impossible a change in the levels of the section or a separation of the joints. The base and casing sections are of the same length and are laid staggered.

the top of the base having an opening to receive the hub or bell of the casing, which locks them together and gives rapidity of construction to the entire line.

The drain base is a part of the main structure, locking the joints of the tile casing, and draining the trench. The lower surface of the drain base is flat, possessing all of the advantages of flat construction, so much desired in all underground work, to make a solid foundation. The drainage is accomplished by leaving the end-to-end joints open for the passage of the water.

The crushed stone or gravel used as a part of this construction is a filter, and prevents the joints in the drain base from becoming clogged with earthy matter during excessive rains.



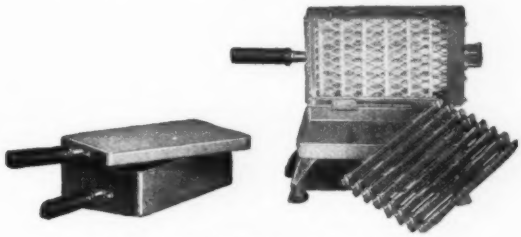
Insulation of Underground Steam Pipes.

The principal materials used in this conduit are what are commercially known as vitrified tile and diatomite, both of which are said to be proof against all elements.

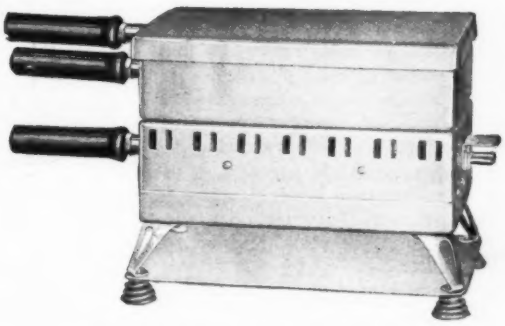
The tile used in this construction is made from a combination of stoneware-clay, spar, and fire-clay thoroughly ground and mixed, free from iron, lime or other foreign substances injurious to a first-class finished product. The clays are mixed uniformly, and will withstand perfectly the heat necessary for vitrification. All the sections are salt-glazed inside and out, and the process is so thorough that the tile is made absolutely waterproof.

The annular tile which incases the iron pipe is cut longitudinally into two sections, these sections forming the top and bottom halves of the conduit. These longitudinal cuts made during manufacture, are not made through the tile, however, but sufficient material is left to keep the two halves intact for splitting on the ground, and these are easily separated by means of a chisel and a slight tap of the hammer. A feature of this conduit is the lip running longitudinally on either side of the lower half, where the casing is split, thus providing not only a rough surface (free from glazing) where the tile is split, but a ledge for support with a groove for the cement which is used to make a tight joint.

The insulating material used inside the tile is diatomite, which consists of microscopically minute formations of practically pure silica, made up chiefly of innumerable skeletons of diatoms containing numberless air cells, and when viewed under a powerful microscope, exhibits the most varied and remarkable shapes. Scientists have found that there are millions of these little hollow bodies to the cubic inch, hence its great insulating properties. All joints in the tile are made with Mastic asphalt cement. This cement is prepared for this particular purpose and is guaranteed to be elastic and waterproof.



Parts of the Radiant Electric Grill.



Electric Radiant Grill Assembled.

The Radiant Electric Grill.

The radiant electric grill provides one of the most flexible and useful cooking devices ever designed for the table, nursery or sick room, or for use wherever desired within reach of a lamp socket. It can be used for toasting, broiling, frying and boiling.

In toasting, the slices of bread may be placed either above or below the radiant heater coil of Calorite wire. Protective gratings located on both sides of the heater coil prevent the substance cooked from coming in contact with the coil.

The lowermost receptacle is the broiler pan. This is provided with a corrugated metal rack, the design of which permits of the ready regulation of the distance of the food from the heater coil. The rack lies on the bottom of the broiler pan; in one position it holds the food away from the heater coil, and by simply turning the rack over, the food is brought closer to the coil.

The uppermost receptacle is the stew pan. It is provided with a cover which can be turned over and used as a frying pan or a griddle. This cover is made of aluminum and therefore does not require the use of grease for making pancakes.

The top of the stove containing the heater coil is hinged to the broiler pan. The hinges are of special design —permitting easy access to the pan below, or allowing the top of the stove to be entirely removed from the broiler pan for the convenient handling of the latter.

The entire device is finished in polished nickel and its neat appearance makes it a pleasing addition to the table, while its capacity of 600 watts adapts it for use on the ordinary lighting circuit. A specially important feature is the ease with which it can be kept clean.

This radiant electric grill is made by the General Electric Company, of Schenectady, N. Y.

The Adaptibox.

The Bonnell Manufacturing Company, of Cleveland, O., has just perfected a new system of sectional outlet and junction boxes with interchangeable parts that affords practically unlimited flexibility. The unit has been given the appropriate name of Adaptibox.

The Adaptibox is a cast-iron conduit fitting made up of six parts. The base part is simply a casting with four supports which hold both the side plates and the cover, so that an assembled Adaptibox is as solid as a single piece of iron. The side plates (Fig. 1) are of five types and all interchangeable so as to provide for any possible combination. There is a blank side plate, an insulating side plate with two outlets and a knockout, a side plate with a lug for rigid conduit, a side plate with a lug for armored cable and an angle lug. These plates are attached to the base by means of screws and it is the work of only a moment to detach or attach them. All threads are carefully cut and tested before they leave the factory. The covers (Fig. 2) are of sixteen different types, embracing every need which might arise in standard construction, including receptacles, rosettes, plug receptacles, etc.

The manufacturer claims that more combinations can be made from a set of Adaptibox parts than is possible with any other type of equipment, so that the contractor need carry only a small stock of parts to be ready for any emergency. The box is handy to work with; it is not only roomy and flexible, but each unit is accurately made and every part fits, so that much valuable time is saved on the job. The assembling can be done in the shop by the boy, in most cases, but when the "hitch" comes, any Adaptibox can be changed over in two minutes on the job to fit any possible conduit combination. This remarkable adaptability is best illustrated by the accompanying cuts, showing a combination of angle lugs (Fig. 3); a large Adaptibox with rigid conduit lugs ranging from four-inch to one-half inch (Fig. 4); a junction between rigid and armored conduit (Fig. 5). These pictures will suggest to the wireman a variety of similar combinations, each of them making it possible to do a cleaner, faster, better and more profitable job.

Fig. 1.

Fig. 3.

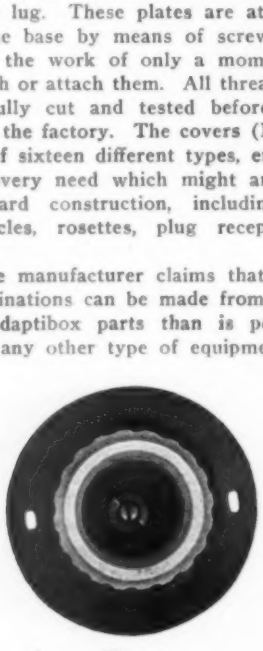


Fig. 2.

Fig. 5.

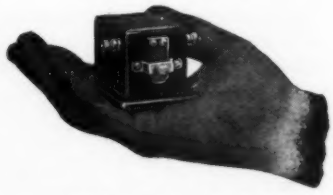
Connecticut Plug and Spark Coils.

A combined spark coil and spark plug has been placed on the market by the Connecticut Telephone & Electric Company, of Meriden, Conn. It is designed principally for marine work, although it can be used on any form of jump-spark engine.

Fig. 4.

The coil is mounted on a solid brass base. Attached to this base is the plug. The top of the coil consists of a gun-metal-finished cap which completely covers the windings and core. Mounted on this coil top is a vibrator with only one adjustment. This vibrator, which forms the most essential part of the coil, has been thoroughly tested by several years actual use. The platinum point does not turn with the contact screw which insures more accurate adjustment. The secondary windings of the coil are more than double the resistance of the ordinary coil used for marine work.

The plug is constructed on the petticoat principle and connects automatically to the secondary of the coil without wire connection. The whole mechanism is very compact. There are just two primary wires, one from the battery to the coil, the other, generally a very short wire, from coil to timer.



Miniature Spark Coil.

When desired, this coil is supplied with a switch and removable lever. While the switch lever is removed, the ignition apparatus is locked and starting of the engine prevented.

In the way of spark coils this company has added to its achievements by making what is said to be the smallest stock coil in the world. The illustration gives some idea of its compactness. This coil is 2⅜ inches long, 1⅛ inches wide and 1½ inches high, and is being used regularly by a well known manufacturer of very small gas engines. While this little coil is small enough for a paper weight, it is a perfect working model and is unusually efficient for its size. It is designed to operate in connection with three dry cells.

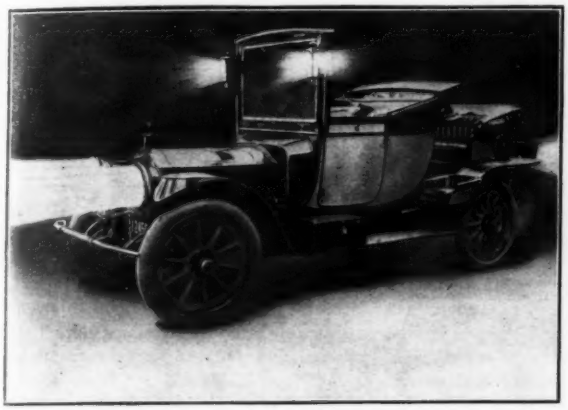
Vest-Pocket Telephones Popular in Berlin.

Compact little telephones have been introduced successfully in Berlin, Germany. A combined transmitter and receiver set is placed in a nickel-plated case two and one-half inches in diameter and three-quarters of an inch thick. This is readily connected to a public contact receptacle, of which a large number have been mounted on lamp-posts, walls, pillars, doors, trees, etc. These receptacles are carefully protected from moisture.

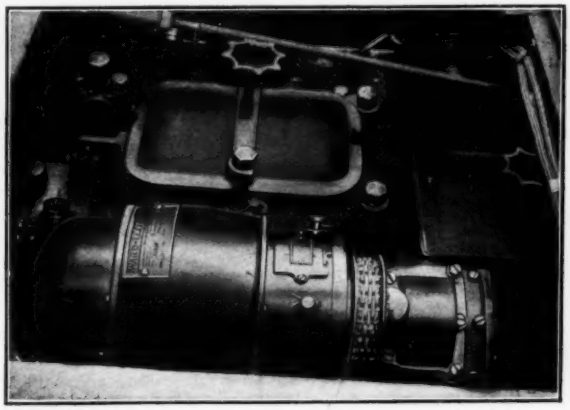
Connecting Plug Coil.

The Ward Leonard Automatic Dynamo System for Automobile Lighting and Ignition.

A new system for automatically supplying electricity for lighting and ignition purposes on gasoline automobiles has been developed by the Ward Leonard Company, of Bronxville, N. Y. It permits all the advantages of electric lighting over oil or acetylene lighting to be attained without the need of removing storage batteries for charging.



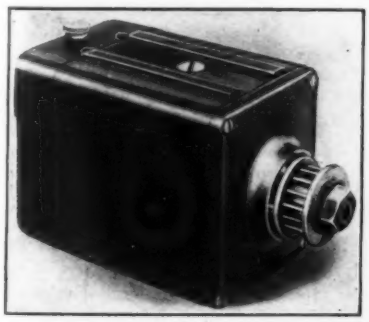
Ward Leonard Automatic Lighting System Applied to a Packard Car.



Typical Mounting of Ward Leonard Dynamo in Chassis.

It concentrates all of the electrical equipment of the car in one highly perfected outfit which is automatically kept keyed up to the best operating conditions.

In principle the Ward Leonard automatic dynamo system is somewhat akin to the axle-driven train-lighting systems now so generally used on trunk railroads; it is much simpler, however, and, instead of being driven from the

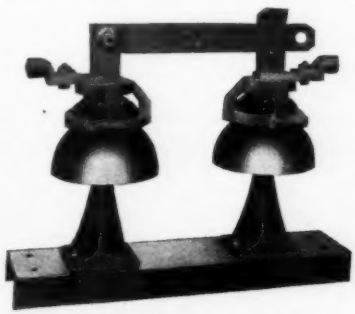


Ward Leonard Automatic Dynamo Set.

axle of the car, it is connected direct to the engine itself.

The equipment consists of three main elements: the dynamo, two storage batteries and the automatic regulator. The dynamo is an extremely compact but efficient little machine driven by the engine through a silent chain and sprocket or spur gearing. While the engine is running, the dynamo furnishes current for any lights that may be on and for charging one of the duplicate storage batteries. This battery is used for lighting when the engine stops or is running at a speed corresponding to less than ten miles per hour. The other battery is used for ignition. A throw-over switch permits the batteries to be interchanged so as to even up their service. Each battery is smaller than the ordinary ignition battery; both are mounted in a compact box and require practically no attention beyond an occasional addition of water to replace that lost by evaporation.

The functions of the regulator are several. When the dynamo speed causes the machine to generate a voltage higher than that of the battery, an electrically operated switch automatically connects them together. When the engine and therefore dynamo speed is again diminished, this same switch disconnects the battery from the dynamo.

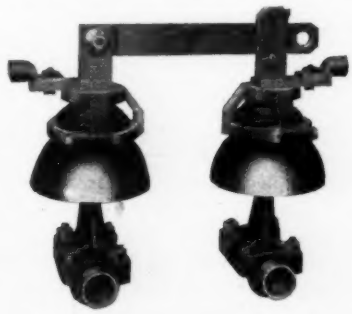


Type B Disconnecting Switch.

If the engine speed becomes very high and the charging current therefore excessive, a resistance is automatically inserted in the dynamo field circuit, cutting down the voltage generated and reducing the charging current. This current is thus kept between two predetermined values suitable for the cells used. Provision is made for preventing overcharge of the batteries. At all times the batteries are kept properly charged; above all, the danger of allowing them to overdischarge is entirely eliminated. The entire system is very simple and requires a minimum of attention.

Locked-Blade High-Tension Disconnecting Switches.

On systems subject to heavy current surges due to short-circuits, etc., it has been found that the heavy magnetic fields generated will often cause the ordinary disconnecting switch to open partially, and while this occurs only under abnormal conditions it is very disastrous owing to the resultant arc between the blade and the switch jaws. To meet the requirements of large capacity stations where heavy short-circuits may occur, the Delta-Star Electric Company, of Chicago, Ill., has developed the type shown herewith



Type E Disconnecting Switch.

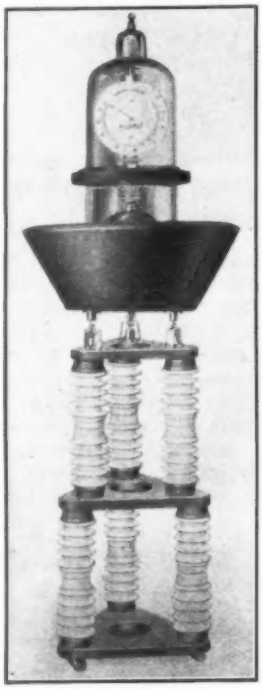
in all capacities, up to and includng 10,000 amperes, the larger sizes being provided with multiple blades.

In all capacities the contact jaws are of the locking type which can be easily closed, but require a positive heavy pull to open, thus guarding against accidental opening under abnormal conditions. A special feature of the design is that in case of an insulator being broken during installa-

tion the defective part can be easily replaced at a small expenditure for material and labor. The current conducting parts are mounted on a special two-piece grip support arranged to clamp the top of the petticoat insulator and by removing two bolts the switch can be quickly dismounted and the broken or defective insulator replaced.

The Type B switch is designed for mounting on side walls or if desired the iron base can be removed and the insulator supports mounted directly on channel iron or other flat support. The Type E switch is so constructed that it can be mounted on standard 1.25-inch pipework.

The hinged blade is provided with locking clamp nuts, preventing loosening due to frequent operation. Both types have a very high factor of insulation, thus insuring minimum trouble from breadown due to excess potentials which might exist during lighting or switching operations.



Siemens & Halske Electrostatic Voltmeter.

The Siemens & Halske Electrostatic High-Potential Voltmeter.

The instrument is based on the principle of attraction between two bodies which are connected with the circuit whose voltage is to be measured. The dielectric between the bodies consists of oil. This has been chosen owing to its high dielectric constant, the power of attraction in the latter being greater than with equal potential in the air. In addition to this, the disruptive power of oil is greater. One of the electrodes is stationary and consists of tin-foil arranged on the outside of the bottom of the oil vessel. The other electrode consists of a cup, with round edges, suspended from a metal strip and swimming in the oil. The metal strip runs over a pulley on the axle of the pointer. Owing to the attraction of the electrodes, a turning moment is exerted on the pointer. The adjustment is effected by the counter action of a spring, from which a bronze tape passes over a second disk on the axle of the pointer, this spring being stretched during the rotation of the axle of the pointer by the attraction of the electrodes. The last mentioned disk is not round, but is of such a shape that the division of the scale is nearly proportional. The proportionality is nearly uniform from about thirty per cent of the maximum pressure upwards. The terminal of the fixed electrode is arranged underneath the vessel, while that of the suspended cup is fixed on top of the instrument.

The cup, all parts of the system and the casing, are conductively connected with each other. The pointer consists of glass, since a pointer of conducting material would cause point discharges. The protecting arrangement against external fields forms an essential part of the instrument. The oil vessel is placed in a tub with round edges surrounding the vessel to about half its height. Furthermore, the upper electrode is surrounded by a bell with round edges which is conductively connected with the casing of the system. The edges of the tub and the protecting bell are arranged almost at the same height. By this means a distortion of the field in which the moving electrode is arranged cannot take place by excess charges in the neighborhood of the instrument.

If the lower pole is grounded, the instrument rests on a cast-iron tripod; in all other cases it is mounted upon a frame with one or two sets of porcelain insulators. The instrument serves for measurements up to 150,000 volts. A smaller type with a range up to 50,000 volts is under construction. The instrument is obtainable in this country from Dr. Karl Georg Frank, 90 West Street, New York City, who is the American representative of the Siemens & Halske firm.

Fire at Plant of American Carbon & Battery Company.

A fire at the plant of the American Carbon & Battery Company, 509 Olive Street, St. Louis, Mo., destroyed one of the main buildings. The loss, estimated at between $75,000 to $100,000, was covered by insurance.

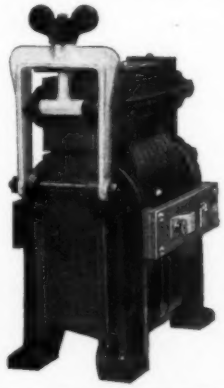
A great deal of machinery was destroyed but only a small amount of the large stock of carbon-brush material and general carbon products were destroyed, as most of this was in a building adjoining the one that burned. Enough finished and semi-finished material is in stock to supply their trade until the plant is rebuilt. Temporary quarters have been arranged and all orders are being filled promptly.

The carbon plant will be rebuilt at once and the company announces that it will be the most complete and up-to-date plant of its kind in the country. Special machinery will be put in to facilitate the manufacture of the new and improved line of motor and generator brushes that they put on the market a short time ago.

Thordarson's Flexible Step-Up Transformers.

The Thordarson Electric Manufacturing Company, 216 South Jefferson Street, Chicago, has developed a new adjustable step-up transformer that is particularly adapted for convenient and rapid wireless work. It is also suitable for testing insulation, generating ozone, etc., where it is important to adjust the voltage by small degrees to give the results desired.

These transformers have an adjustable shunt around the magnetic circuit which by means of a thumb screw permits the magnetic reluctance to be varied between wide limits. The transformers are made in two sizes, one having a current range from 1 to 7 amperes and a maximum secondary voltage of 10,000; the other has a current range from 2.5 to 9 amperes and a maximum secondary voltage of about 20,000. In each case the primary can be connected direct to the circuit without intermediate impedances or resistances. Standard primary windings are suitable for 100 to 120 volts and 60 to 133 cycles. The entire apparatus is of rugged construction and yet quite compact.



Thordarson Flexible Step-Up Transformer.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

HITCHCOCK, S. D.—The council will build a modern electric light plant here this spring. C.

MITCHELL, S. D.—Arc lights will be replaced with boulevard lights on various streets. C.

LINCOLN, MO.—W. C. Cain is about to construct an electric light plant here.

REYNOLDS, N. D.—The project of an electric light plant is being agitated in Reynolds.

MOVILLE, IOWA.—Edgar Metcalf is planning the erection of an electric light plant for the town.

HILLSBORO, KAN.—This city will vote $10,000 in bonds for the establishment of an electric light plant.

HARMON, OKLA.—This city has voted $3,500 in bonds for the establishment of an electric light plant.

MILTON, N. D.—The Milton Commercial Club is agitating the project of an electric light plant for the town.

TRENTON, MO.—The Trenton Gas & Electric Company has been incorporated with a capital stock of $50,000.

MOLINE, ILL.—It is expected that twenty-five to fifty new street lights will be placed about the city at an early date.

VERNO, B. C.—The electric power plant of the Coteau Power Company, which was destroyed by fire will be rebuilt. A.

HANCOCK, ILL.—Fred Jensen, of this city, is seriously investigating the proposition of building an electric light plant in Hancock.

BEVERLY, MASS.—The Buzzard's Bay Electric Company proposes to erect a new power station on the shore of Deacon's Pond harbor.

ELK POINT, S. D.—P. E. Ellis, Ova J. Henkin and Thomas Dwyer have been granted a franchise to build and maintain an electric light plant. C.

ALTOONA, IOWA.—George T. Gibson has been granted a franchise to build and maintain an electric light plant. Work will be started at once. C.

CORUNNA, MICH.—This city has decided to erect a municipal lighting plant in connection with its waterworks. Work will be started at once.

OSOYOOS, B. C.—Bruce White is at the head of an organization which plans for the erection of a power plant on Little Okanagan Lake, near Osoyoos. A.

PRINCETON, CAL.—The Northern California Power Company has acquired property at Princeton, and plans for the erection of a new substation. A.

SEWARD, ALASKA.—The Kenai-Alaska Gold Mining Company will build an electric power plant on its properties. J. R. Hayden is president of the company. A.

HUMBOLDT, IOWA.—The Northern Iowa Power Company is excavating for the new power house. Work will continue all winter and the plant will be completed by spring. C.

LYNN, MASS.—A committee from the Lynn Board of Trade has in hand a plan for the installation of a better lighting system in the business district, which is estimated to cost $12,000.

BOISE, IDAHO,—The Idaho-Utah Electric Company has filed articles of incorporation. The company will furnish power and illumination for the town of Preston, and possibly for other towns near by.

ABERDEEN, S. D.—Announcement is made that an electric light and power plant, costing about $200,000, will be constructed in Aberdeen. C. T. Kountz, an Omaha capitalist, is taking an active tive interest in the project.

CONCORD, MASS.—The Public License Commission has issued an order authorizing the issue of 160 shares of preferred stock of the Milford Light & Power Company, amounting to $16,000, the proceeds to be used for improvements.

WESTON, W. VA.—The People's Electric Light, Ice & Water Power Company has been incorporated with a capital stock of $100,000. The incorporators are M. S. Holt, J. M. Foster, Geo. A. Hatsel, C. M. Smith and Ross L. King.

SANTA MONICA, CAL.—The Southern California Edison Company will rebuild its lighting and power circuits at Santa Monica, to comply with recently enacted state laws. The improvement is estimated to cost about $30,000. A.

BAKER, ORE.—The Central Oregon Power & Irrigation Company, recently incorporated, plans for the installation of electric pumping plants for irrigation work in the Malheur Lake district. W. A. Pope is president of the company. A.

DALLAS, IOWA.—The Rock Island will erect at this point a large power plant for the purpose of generating electricity for the operation of interurban freight and passenger trains over certain portions of its lines, which will probably include a distance of 120 miles.

ST. LOUIS, MO.—David P. Leahy, Richard J. Baldwin and Philip A. Smith have been granted a franchise by the St. Louis County Court to erect and maintain a plant to supply light and power to St. Ferdinand and Central Townships for fifty years.

SAN BERNARDINO, CAL.—The Needles Gas & Electric Company has been incorporated with a capital of $100,000 to supply the town of Needles with gas and electricity. The dirctors are Harry Torchiana, B. L. Devol, and A. Mildreth, of Los Angeles.

SHENANDOAH, IOWA.—The City Council has entered into a contract with the electric light company here for the installation of 165 tungsten lamps of 100 candlepower for the residence district and twenty arc lights of 3,000 candlepower for the business streets.

MANILA, P. I.—An electric light and power plant of considerable size, operated by water turbines and crude-oil engines, is to be installed here next year. J. E. Stevenot, the engineer in charge, desires data and prices on both power-plant apparatus and electrical supplies.

LAKEVIEW, ORE.—The Warner Lake Irrigation Company, Portland, plans for the construction of a hydroelectric power plant on Deep Creek, near Lakeview. Electric pumping plants will also be installed for irrigation work. W. V. Bradford is president of the company.

GREENVILLE, O.—The Greenville Electric Light & Power Company proposes to use the entire proceeds of a $25,000 stock issue for additions to its plant and extensions of its service. The New Madison Lighting Company intends to issue $3,500 common stock for similar purposes.

CAMAS, WASH.—The Northwestern Electric Company of Portland will soon commence the construction of its proposed transmission system from the hydroelectric power plant on White Salmon River, now building, to Camas, a distance of approximately 60 miles. Surveys are in progress. A.

CLEVELAND, O.—The Cleveland, Randall & Eastern Railway & Power Company, has been incorporated with a capital stock of $10,000 to engage in the manufacture and sale of electricity. The incorporators are R. H. Jamison, Harley S. Adams, Claude W. Shimmon, D. S. Sheet and H. W. Dickson.

BELDEN, CAL.—The Oro Electric Light & Power Company, Sacramento, has announced that $7,000,000 has been appropriated for a mammoth dam to be constructed near Belden. General Manager Van der Naillen will have charge of the operations and will push the work with all possible force.

OROVILLE, CAL.—The Oro Electric Corporation is making surveys for its new transmission line from the proposed hydroelectric power plant in Humbug Valley, near Pentz, to Marysville and Sacramento, via Oroville, a distance of approximately 100 miles. F. V. Pering is at the head of the company. A.

KALAMAZOO, MICH.—A plan is under way to install an ornamental lighting system in the business district of Kalamazoo. A committee composed of Alderman Charles C. Cutting, Edward M. Chidester, Frank Godfrey, former Mayor Samuel Folz and H. Clare Jackson has been appointed to have the matter in charge.

LOS ANGELES, CAL.—The Board of Public Works has instructed the Los Angeles Gas & Electric Company to install 100 new arc lamps in the East Hollywood and Wilshire districts. This is one-fifth of the total which the company will install during the present year, in accordance with its lighting contract with the city. A.

PROVO, UTAH.—The Knight Power Company and the Utah County Light & Power Company have merged into one corporation which represents a paid-up capitalization of about $2,000,000. The new company is already planning to extend its operations by the erection of two or three more plants, one of which will shortly be constructed on the Provo River.

LOUISVILLE, KY.—The Cumberland Electric Light, Heat & Power Company has been organized with a capital stock of $3,000,000 for the purpose of furnishing electric light and power to Frankfort, Lexington and Louisville, in addition to small towns en route. The company will build an immense power plant on the Cumberland Falls.

SANTA ROSALIA, CHIH., MEX.—The Northern Power Company will soon commence the erection of its proposed hydroelectric power plant on the Conchos River. The plant is estimated to have a capacity of 45,000 horsepower. Power lines will be constructed to Parral, Chihuahua and Santa Barbara. The headquarters of the company are understood to be at Montreal, Can.

NEW YORK, N. Y.—The Puget Sound Traction, Light & Power Company has been organized with a capital stock of $40,000,000. This concern will acquire the property of five light and traction companies in the Puget Sound district for the purpose of consolidation. A committee composed of the following has been appointed to carry out the plan for the exchange of stock: Thomas N. Perkins, of Ropes, Gray & Gorham; Albert W. Harris, of N. W. Harris & Company; George C. Lee, of Lee, Higginson & Company; Philip Stockton, president of the Old Colony Trust Company; and Harry K. White.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

TOPEKA, KANS.—A police telephone system will be installed in Topeka early in 1912.

SPARTA, TENN.—The Home Telephone Company will extend its lines into all parts of White County as soon as the weather will permit.

WINNIPEG, MAN.—The Canadian Pacific Railway Company will add between 1,000 and 1,200 miles of new telephone circuits for dispatching trains.

DEMING, N. M.—The Rural Telephone Company will extend its long-distance lines to Columbus, Iola and Tunis. Hugh Ramsey is president.

BIRMINGHAM, ALA.—Extensive improvements are being planned by the Bell Telephone & Telegraph Company, at an approximated cost of over $200,000.

MACOMB, ILL.—The Macomb Telephone Company has been organized with a capital stock of $50,000. C. K. Todd, of this city, is one of the heads of the company.

ALLENTOWN, PA.—It is announced that $17,000 will be spent by the Bell Telephone & Telegraph Company in Allentown this year for the extension of its service.

SOUTH PASADENA, CAL.—The Home Telephone Company of Los Angeles is understood to be planning for the construction of a system and exchange at South Pasadena. A.

HUSUM, WASH.—The Mutual Telephone Company, J. E. Slade, manager, will soon commence the construction of a line from Underwood to Trout Lake a disance of 30 miles. A.

LOOKEBA, OKLA.—The Lookeba & Binger Telephone Company has been incorporated with a capital stock of $500. The incorporators are J. S. Sensintaffar, J. D. Inman, L. W. Vance, B. E. Brown, J. J. Chambers.

JAMESTOWN, N. D.—The entire property known as the Central Telephone Company of Stutsman County, has been sold at auction to the North Dakota Telephone Company, of Fargo, for $8,000. It will be remodeled. C.

INDIANAPOLIS, IND.—The New Elden Telephone Company has been incorporated with a capital of $750. The directors are J. E. Farrell, Elwood Barnard, S. H. Trueblood, H. W. Umbenhower and J. H. Day.

PROVO, UTAH.—The Palmyra Telephone & Electric Company has filed articles of incorporation with $2,500 capital stock. The following are directors: S. P. Thomas, M. Baadsguard, Erastus Hansen, E. M. Banks and R. F. Thomas.

ELKINS, W. VA.—The Chenoweth Valley Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are C. W. Ward, Fred Chenoweth, H. A. Chenoweth, Stark Chenoweth and Wade Hart, all of Elkins.

KELLOGG, IDA.—The North Idaho Telephone Company will install a new switchboard panel at its local exchange. A mercury-arc rectifier is also planned. The improvement is estimated to cost $4,000. Walter C. Clark is president. A.

WILLS POINT, TEX.—The Union Telephone Company, which was granted a franchise recently by the City Council here for the installation of a telephone exchange, will put in modern equipment and make the system substantial in every respect. D.

SAN DIEGO, CAL.—The Pacific Telephone & Telegraph Company will build a new exchange in the University district, a new four-mile underground conduit system will be installed and other extensions and improvements are planned. The work is estimated to cost $100,000.

QUANAH, TEX.—A local independent telephone company has been formed here by J. L. Tullis, W. T. Perkins and F. B. Kirby for the purpose of installing a telephone system and the construction of long-distance lines from Quanah to various points in this section. Mr. Kirby is general manager. D.

EL PASO, TEX.—The Tri-State Telephone Company, which has its headquarters here, will soon begin the construction of a long-distance line from Pecos, Tex., to Carlsbad, N. M. It will also construct a long-distance line from Pecos to Midland, Tex., and will rebuild a number of shorter lines which extend to Alpine, Marfa and other places in the trans-Pecos district. The company has appropriated about $125,000 for these improvements and extensions. D.

ELECTRIC RAILWAYS.

(Special Correspondence.)

LEWISTOWN ,ILL.—It is proposed to have the Canton Interurban Line connect Lewistown and St. David in the near future.

EVANSVILLE, IND.—The proposed traction lines to Chrisney and Lynnville, it is stated here, will be built in 1912.

TWIN LAKES, IDAHO.—The Twin Falls, Arcadia City & Oakley Interurban Railway Company has been incorporated.

MASSILLON, O.—The Wheeling & Lake Erie Railroad is planning to install electric cars on its Brewster-Orville branch.

OLIVET, S. D.—The Olivet Interurban Railway Company has been former to build an electric interurban line to Tuscan. C.

CALISTOGA, CAL.—The San Francisco, Napa & Calistoga Railway Company has been granted a franchise to operate electric cars along the streets of this city.

NEW IBERIA, LA.—The Southwestern Traction & Power Company will proceed at once with the extension of the interurban line to connect New Iberia and Jeanerette.

MANKATO, MINN.—The Mankato Electric Traction Company will build a line to North Mankato when the bridge has been strengthened sufficiently to carry the cars. C.

CALISTOGA, CAL.—The San Francisco, Napa & Calistoga Railway Company has been granted a franchise for a line at Calistoga. M. McIntyre is superintendent of the company. A.

MARION, IND.—The Indiana Union Traction Company has decided to build an extension and loop of its lines in West Marion. The line will be used for both passenger and freight service.

DALLAS, TEX.—The Dallas Southern Traction Company has been granted a franchise by the City Commission for the construction of an electric railway upon certain streets of the city. D.

RAYMOND, WASH.—J. B. Bridges, Jay D. Crary and associates have organized a company, capitalized at $200,000, to build a line from Raymond to South Bend, a distance of about seven miles. A.

MONTEREY, CAL.—The Pacific Improvement Company is going to build a road from Pacific Grove to Pebble Beach. A clearing of the right of way through the Seventeenth Nile Reservation from Lake Majela is now being made.

BRENHAM, TEX.—The construction of an interurban electric railway between Brenham and La Grange, a distance of about 32 miles, is planned by a syndicate of northern men. The Brenham Commercial Club is interested in the project.

PORTLAND, PA.—The Stroudsburg & Delaware Water Gap Trolley Company has been granted a franchise to construct a connecting link through Main Street with the tracks of the Stroudsburg & Delaware Water Gap line.

BLOOMINGTON, ILL.—It is reported that the Illinois Traction Company intends to commence soon the construction of a new Central Illinois Division. The line is to run from Bloomington to Champaign and will

tap one of the richest pieces of land in Illinois.

KLAMATH FALLS, ORE.—A suburban road from Lakeview to Klamath Falls is planned for the spring of 1912. The distance will be practically 110 miles by way of Bly and Bonanza.

SACRAMENTO, CAL.—Announcement has been made that the Western Power & Electric Company will start work on the construction of its line from Sacramento to Oakland very soon, and will later build to Martinez, along the Sacramento River.

ST. LOUIS, MO.—J. D. Houseman, constructor of electric railroads, is agitating the construction of an electric line extending from Carondelet through St. Louis County and connecting with a proposed new bridge over the Mississippi River.

OKLAHOMA CITY, OKLA.—John W. Shartwell, one of the vice-presidents of the Oklahoma Northwestern Railway Company, has announced that the proposed railway will be built at once. This will open up the isolated northwestern part of the state.

ROUNDUP, MONT.—Business men have subscribed $11,000 for the construction of an electric railway to connect this city with adjoining coal camps. It is intended to incorporate the Roundup Railway, Light & Power Company with a fully paid up capital of $50,000. C.

MODESTO, CAL.—The Tidewater & Southern Electric Railway Company will soon commence the construction of a line on Ninth Street, franchise for which was recently granted, in connection with its road from Stockton to Modesto, now building. J. H. Wallace is chief engineer. A.

SKOWHEGAN, ME.—There is a movement under way to construct an electric railway between this place and Shawmut, to connect with the Shawmut & Fairfield Line. Engineer John A. Jones, of Lewistown, has made a survey of the highway. The length of the proposed line is about sixteen miles.

SEATTLE, WASH.—The Kirkland-Redmond Railway, Light & Power Company has filed articles of incorporation and obtained franchises from the city of Kirkland to build a railway between this city and Novelty, in Cherry Valley. The company also proposes to erect a power plant in Kirkland and furnish electricity to the city.

SCRANTON, PA.—Official announcement has been made of the merger of the Northumberland County Traction Company and the Sunbury & Sellinsgrove Electric Street Railway Company. The announcement also states that extensive additions already started will be completed and that Scranton and Berwick will be connected by trolley.

PHOENIX, ARIZ.—The Phoenix Railway Company plans for the immediate extension of its line on Second Street, and the double-tracking of its First Street line. The company's bond issue of $1,250,000, recently voted for construction and improvement work, has been secured by the filing of a mortgage in favor of the Los Angeles (Cal.) Trust & Savings Bank.

NAUVOO, ILL.—The Keokuk, Nauvoo and Fort Madison Electric Railway Company has been incorporated with a capital stock of $650,000. The incorporators are W. H. Fisher, C. H. Petach, F. M. Catlin, E. J. Meier and W. P. Canby. The company is to build a railroad from Keokuk through Hancock County, Ill., to Fort Madison, Iowa, with branch lines to Nauvoo and Carthage.

RISING SUN, IND.—The Indiana & Ohio Southern Railway Company is the name of a new interurban company which has filed articles of incorporation with a capital of $150,000. The object of this corporation is for the immediate construction and operation of a line between Rising Sun and Aurora, a distance of ten miles. The incorporators are J. W. Whitlock, James N. Perkins and Lucean Harris.

OKLAHOMA CITY, OKLA.—It is understood that the Patterson interests, which operate street car lines in parts of this city and have franchises covering the entire city, which were recently upheld by the Oklahoma supreme court, are endeavoring to secure the franchise for the construction of an electric line from Lawton, Okla., to Fort Sill, the biggest army post in the Southwest. It is understood that the Patterson Company will commence construction work at once.

NEW INCORPORATIONS.

LOS ANGELES, CAL.—The Wade-Gough Electric Company has been incorporated by K. L. Wade, P. G. Gough and E. E. Kelly, with a capital of $10,000. A.

RACINE, WIS.—The Racine Electric Company has been incorporated with a capital stock of $10,000. The incorporators are John W. Ruggzber, T. Tolofson and William Nelson.

MADISON, WIS.—The Wisconsin Service Company has been incorporated with a capital stock of $1,000,000 for the purpose of operating public service utilities in Northern Wisconsin.

SAN FRANCISCO, CAL.—The Eureka Electric & Engineering Company has been incorporated with a capital of $75,000. E. E. and E. L. Combs, O. F. Metz and H. L. Morrison are incorporators.

EUREKA, CAL.—The Eureka Electric and Engineering Company has been incorporated with a capital stock of $75,000. The incorporators are O. F. Metz, H. L. Morrison, O. L. Berry, E. E. and E. L. Combs.

MINNEAPOLIS, MINN.—The Minneapolis Electric Motor Company has been incorporated with a capital stock of $50,000. The incorporators are W. H. Vilett, John W. Helm, and C. L. Holton; all of Minneapolis.

MILWAUKEE, WIS.—The Downing Smith Company has been incorporated with a capital stock of $15,000 to deal in electrical machinery and apparatus. The incorporators are Condit Voorhees, Ingvail N. Herreld, Harry D. Irwin.

INDIANAPOLIS, IND.—The Century Electric Company has been incorporated with a capital stock of $1,000 to deal in electric goods. The directors are J. H. Wooling, James Van Natta, C. W. Mabey, H. W. Schwimmer and W. W. Spencer.

SAN FRANCISCO, CAL.—The Electric-Lens Sign Company has been recently incorporated with a capital of $100,000. The incorporators are J. Gaffney, Leo Meyberg, G. H. Bradner and R. N. Fitch. Offices will be at San Francisco. A.

MANHATTAN, N. Y.—The New York Electric Laundry Corporation has been incorporated with a capital stock of $10,000. The incorporators are Haverly B. Swart, Glen Ridge, N. J.; G. Edwin Sawyer, New York City.

BROOKLYN, N. Y.—The Reiss & Reiss firm has been incorporated with a capital stock of $2,000 to engage in the manufacture of electrical supplies. The incorporators are Louis Finver, Lena Haupt, and Benjamin Haupt, all of Brooklyn.

MANHATTAN, N. Y.—The Barker Electric Company has been incorporated with a capital stock of $6,000 to engage in electrical work. The incorporators are John E. S. Barker and Ida F. Barker, of Yonkers, N. Y., and Edgar V. R. Ketchum, of New York City.

SUFFERN, N. Y.—The Thorpe Electric Company has been incorporated with a capital stock of $5,000 to engage in electrical contracting. P. N. Thorpe, E. L. Thorpe, Paterson, N. J., and Henry A. Quackenbush, Suffern, N. Y., are the incorporators.

ROCHESTER, N. Y.—The O'Connell Electric Company has been incorporated with a capital stock of $1,000 to deal in electrical supplies. Eugene J. Dwyer, John J. O'Connell, Irene O'Connell and Timothy O'Connell, Rochester, are the incorporators.

MANHATTAN, N. Y.—The Postal Electric Supply Company has been incorporated with a capital stock of $2,500. Warren S. Hallett, William B. Dunn and Lewis MacConnach, New York City, are the incorporators.

CLEVELAND, O.—The Electric Magnetic Appliance Company has been incorporated with a capital stock of $100,000. The company will manufacture electrical machinery. Robert Williams, M. Goodhue, S. H. Blakeslee and J. A. Curtis are the incorporators.

BATH, ME.—The Maine Hydraulic Power Company has been incorporated with a capital stock of $1,500,000. The purpose of the company is to construct plants, factories, etc., for obtaining power from the tides and waves of salt or fresh water. The president and treasurer of the company is William S. Maxwell, Paterson, N. J.

LOS ANGELES, CAL.—The Citrus Belt Gas Company has been incorporated with a capital of $1,500,000 by E. D. Roberts, A. M. Ham and Z. T. Bell, Los Angeles; E. S. Moulton, Riverside, and F. P. Morrison, Redlands. The company will operate in electrical as well as gas properties. It has taken over the San Bernardino Valley Gas Company, of San Bernardino. A.

SARATOGA SPRINGS, N. Y.—With a capital of $12,000,000, of which $2,500,000 will be preferred, the Adirondack Electric Power Corporation has been incorporated. The company is to take over the property and franchise of the Hudson River Water Power Transmission Company, the Empire State Power Company, the Balston Spa Light & Power Company, the Hudson River Electric Company and the Madison County Gas & Electric Company. The directors of the new incorporation are John P. Reynolds, Francis M. Edwards and James R. Hooper, of Boston; Edgar T. Brackett, Saratoga Springs; Wilson A. Shaw and Charles E. Willeck, Pittsburg; John S. Scully, Washington, and Edwin S. Webster, Chestnut Hill, Mass. The Stone & Webster Management Association, Boston, has agreed to act as manager.

FINANCIAL NOTES.

Returns for the week ending January 13 show rather wide variations, with leading industrials a fraction lower than the week previous. General Electric had a net gain of over four points, the Mackay companies gained one and one-half points, Western Union gained two and seven-eighths points, and Westinghouse common, with sales of 12,500 shares, made a net change of five points to the good. Railroad gross earnings during December made a less favorable comparison with those of December, 1910, and reports for the first week in January seem to indicate a continuance of contraction. The improvement noted recently in the steel trade is keeping up, and tonnage requirements make the outlook more than reasonably good. The determination upon the part of the New York, New Haven & Hartford Railroad Company to extend its electrification from Stamford to New Haven, Conn., a distance of thirty-eight miles, will involve contracts with the Westinghouse companies to the amount of $12,000,000 to $15,000,000. The placing of this big order means the doubling of the electric track system of the railroad. It is expected that the new order will call for 100 additional locomotives, and it is predicted that within the next five years the electrical operations will extend from Boston to New York. This will mean steady work for the Westinghouse employees for the next two years at least.

Stone & Webster have drawn up a plan for the reorganization of a new company, to be known as the Puget Sound Traction, Light & Power Company, for the purpose of acquiring and consolidating the properties and assets of the Pacific Coast Power Company, the Seattle Electric Company, Seattle-Tacoma Power Company, Puget Sound Electric Railway, and Whatcom County Railway & Light Company. The new holding company will start with authorized capital stock of $15,000,000 six per cent cumulative preferred and $25,000,000 of common. It is proposed to exchange the new company's stock for the preferred and common shares of all but the Seattle-Tacoma Power Company, whose property and assets it is proposed to purchase. If all such stocks are exchanged on the terms offered, there will be required $11,100,000 of the Puget Sound's preferred and $20,328,000 of the common stock. It is estimated by Stone & Webster that not more than $8,000,000 will be needed in 1912 for the purchase of properties, retirement of underlying indebtedness, and to provide for extensions and improvements.

Meeting of the bondholders' and stockholders' protective committees of the Toledo Railways & Light Company, which was scheduled for January 15, to take action on the reorganization plan, has been postponed to January 29.

A new electric line from Columbus to Toledo, Ohio, known as the Columbus, Urbana & Western Electric Railway Company, of Columbus Ohio, has asked permission of the Public Utilities Commission of that state to issue $5,500,000 in bonds and $500,000 in common stock.

There will be no increase in the dividend rate of the Western Union Telegraph Company, when the directors hold their next quarterly meeting in March according to a statement made recently by President Theodore N. Vail. Mr. Vail, said that when the rate was to be increased the investing public would be given ample warning.

Dividends.

Columbus Railway Company; the regular quarterly dividend of one and one quarter per cent on the preferred stock, payable February 1 to stock of record January 15.

Grand Rapids Railway Company; quarterly preferred dividend of one and one quarter per cent, payable February 1 to stock of record January 15.

Havana Electric Company; quarterly common and preferred dividends of $1.50 each payable February 10 to stock of record January 20.

Railways Company General; quarterly dividend of one per cent, payable February 1.

United Traction Company, of Pittsburgh, the regular semi-annual dividend of two and one-half per cent on the preferred stock, payable January 20 to stock of record January 10.

York Railways Company; a dividend of two per cent on preferred stock, payable January 30, to stock of record January 20. Last June a dividend of one per cent was declared.

Citizens Telephone Company, fifty-eighth consecutive dividend of two per cent, payable January 20.

The Manchester Traction Company, regular quarterly dividend of two per cent, and an extra dividend of five per cent, payable January 15.

Reports of Earnings.

RUTLAND RAILWAY LIGHT & POWER.

The Rutland Railway, Light & Power Company reports for the year ended December 31, 1911, compared as follows:

	1911.	1910.
Gross earnings	$318,665	$276,527
Expenses and taxes	167,864	154,885
Net earnings	150,801	121,642
Interest charges	84,747	79,301
Surplus	66,054	42,341

NORTHERN OHIO TRACTION & LIGHT.

The Northern Ohio Traction & Light Company reports for the year ended December 31, 1911, compared as follows:

	1911.	1910.
Gross earnings	$2,454,651	$2,235,453
Operating expenses	1,359,562	1,233,947
Net earnings	1,095,088	1,001,505
Fixed charges	487,120	476,894
Surplus	607,968	524,611

EDISON COMPANY OF BOSTON.

The report of the Edison Electric Illuminating Company of Boston for the month of December and six months ended December 31, compares as follows:

	1911.	1910.
December gross	$ 582,140	$ 542,463
Expenses	205,547	204,928
December net	376,593	337,535
Six months' gross	2,770,126	2,486,239
Expenses	1,144,995	1,082,525
Six months' net	1,625,131	1,403,714

AMERICAN TELEPHONE & TELEGRAPH.

The American Telephone & Telegraph Company and associated holding and operating companies in the United States, not including connecting independent or sub-license companies, report for the eleven months ended Nov. 30, 1911, with all duplications excluded, compared as follows:

	1911.	1910.
Gross revenue	$163,686,329	$150,244,013
Expenses and taxes	63,200,626	56,608,997
Balance	100,485,703	93,635,016
Maintenance and depreciation	53,519,562	47,638,782
Net revenue	46,966,141	45,996,234
Interest	12,534,923	10,513,012
Net income	34,431,218	35,483,222
Dividends	23,603,413	23,093,938
Surplus	10,827,805	12,389,284

KINGS COUNTY ELECTRIC.

The report of the Kings County Electric Light & Power Company and Edison Electric Illuminating Company, of Brooklyn, for November, shows the following, as compared with the corresponding period a year ago:

Comparative Combined Earnings and Expenses.

	Nov., 1911.	Nov., 1910.
Gross earnings	$454,190	$403,933
Operating expenses, including general technical, production and distribution expenses	197,111	178,780
Net over operating	$257,079	$225,153
Bond discount, written off	1,689	1,689
	$255,390	$223,464
Depreciation	64,052	52,890
	$191,337	$170,574
Fixed charges—bond interest, including interest on unfunded debt	70,546	63,198
Profit and loss surplus for the month	$120,791	$107,376
January 1, to November 30, Inclusive.		
Gross earnings	$4,309,408	$3,905,675
Operating expenses, including general technical, production and distribution expenses	2,130,049	1,871,307
Net over operating	$2,179,358	$2,034,367
Bond discount written off	18,579	18,579
	$2,160,778	$2,015,787
Depreciation charges	538,323	476,155
	$1,622,455	$1,539,631
Fixed charges—bond interest, including interest on unfunded debt	734,222	669,296
Profit and loss surplus for eleven months.	$ 888,232	$ 870,335

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 15.	Jan. 8.
Allis-Chalmers common (New York)	¾	1¾
Allis-Chalmers preferred (New York)	6½	8
American Tel. & Tel. (New York)	140⅝	137⅞
General Electric (New York)	159	155⅝
Kings County Electric (New York)	129	129
Postal Telegraph and Cables common (New York)	78	79
Postal Telegraph and Cables preferred (New York)	68½	69⅞
Western Union (New York)	83¼	80⅝
Westinghouse common (New York)	72¾	68
Westinghouse preferred (New York)	114¼	117½
Edison Electric Illuminating (Boston)	297	296
Massachusetts Electric common (Boston)	22	22½
Massachusetts Electric preferred (Boston)	95½	96
New England Telephone (Boston)	158	153
Electric Company of America (Philadelphia)	12	12
Electric Storage Battery common (Philadelphia)	53¼	53
Electric Storage Battery preferred (Philadelphia)	53¾	53
Philadelphia Electric (Philadelphia)	17⅝	17¼
Chicago Telephone (Chicago)	137	137½
Commonwealth Edison (Chicago)	139½	136
National Carbon common (Chicago)	108½	110
National Carbon preferred (Chicago)	119	118

PERSONAL MENTION.

LEO H. BAEKELAND was elected president of the American Institute of Chemical Engineers at the recent meeting held in Washington, D. C.

THOMAS A. EDISON stood highest on the list of the ten greatest men now living, according to the vote taken by the *Strand Magazine*, in London.

OLIVER T. BOYD, general passenger agent of the Hudson & Manhattan Railroad Company, has been appointed assistant general manager of that company.

JOSEPH UNDERLEAK, Chatfield, Minn., president of the Chatfield Electric Light & Power Company, has been elected president of the First National Bank of Chatfield.

E. C. FOSTER, New York, N. Y., has been appointed president of the Manchester Traction, Light & Power Company, Manchester, N. H., succeeding William A. Tucker, of Boston.

WILLIS R. WHITNEY, director of the research laboratory of the General Electric Company, lectured before the Middletown Scientific Association on January 9, his subject being "Research Laboratory Notes."

ELIHU THOMSON will present a paper before the Schenectady Section of the American Institute of Electrical Engineers on January 23. The subject of the paper is "The Hunt for a Great Meteor and Its Lessons."

FREDERICK W. WHITRIDGE was elected president of the Third Avenue Railway Company, New York City, at a directors' meeting last week. Edward A. Maher was elected vice president and general manager.

ARTHUR D. LITTLE, president-elect of the American Chemical Society, has been nominated by the Alumni Association of the Massachusetts Institute of Technology as a member of the corporation of that institution.

CHARLES E. WILDE, Grand Rapids, Mich., for the past eight years head of the Grand Rapids division of the Michigan State Telephone Company, has been promoted to be general commercial superintendent of the company.

HARRY B. LOGAN, president of Dossert & Company, sailed from New York on the steamship *Almirante* on January 17 on a trip to the West Indies and Central America, including the Panama Canal.

L. J. CORBETT has been made associate professor of electrical engineering in the University of Idaho. Professor Corbett was graduated at the University of California in 1902, and since that time has been obtaining practical experience.

O. M. RAU, chief electrician and superintendent of lighting of the Milwaukee Electric Railway & Light Company, has resigned to engage in other work. Mr. Rau will leave office on February 15, on which date he will have completed fifteen years of service with the company.

CHARLES E. BRYAN, Baltimore, Md., who has been division superintendent of the Chesapeake & Potomac Telephone Company, has been made commercial agent for the general division of the company, which includes Maryland, District of Columbia, Virginia and West Virginia. Mr. Bryan's headquarters will remain at Baltimore.

E. R. DAVIS has been appointed general manager of the Pacific Light & Power Corporation, Los Angeles, Cal., succeeding A. C. Balch. Mr. Davis was formerly electrical engineer and assistant general manager. H. A. Barre has been appointed electrical engineer to fill the vacancy caused by the promotion of E. R. Davis.

GEORGE W. JACKSON and E. A. CLARK have organized a company to take over the engineering work formerly done by George W. Jackson, Incorporated. The new firm has secured offices at 754 Jackson Boulevard, Chicago, Ill., and 228 West Forty-Second Street, New York, N. Y. Under the name of George W. Jackson & E. A. Clark Company, the firm will carry on examinations, reports, designs, contracting and general consulting engineering.

FRED W. BALLARD has been appointed constructing engineer of the new $2,000,000 municipal electric light plant which is to be put up in Cleveland, O., by the new administration of that city. For nine years Mr. Ballard has been chief engineer of the Sherwin-Williams Company, where he has had connection with the operation and construction of many electric power plants. Prior to that he was one of the editors of *Engineering*. Mr. Ballard is a Cornell graduate and an enthusiastic advocate of municipal ownership.

GUY E. TRIPP has resigned as vice-president of Stone & Webster, to take up his duties immediately as chairman of the Westinghouse Electric & Manufacturing Company. For the next few weeks Mr. Tripp will devote his time between Stone & Webster and the Westinghouse interests. However, the new Westinghouse chairman will not abandon the reorganization work of the Metropolitan system in New York until the final details are completed. This will take between thirty and sixty days. After that period two of the six directors of the New York Railways Company, representing the bondholders, will resign to give way to Interborough-Metropolitan men. This will give Interborough-Metropolitan five directors, and the bondholders four. It is thought Mr. Tripp may be prevailed upon to remain as a permanent director of the new company, to protect the interests of the bondholders.

OBITUARY.

JOSHUA A. BINION died at Johannesburg, South Africa, on November 27, at the age of 40. Mr. Binion was associated with the engineers who planned the New York subways and took a prominent part in that work. He had gone to South Africa for his health.

JOHN KIMBALL ALLEN, formerly connected with D. Van Nostrand Company, book publishers in New York City, died on January 8 in the eightieth year of his age. He retired from active business in 1908 after having had extended connection with the publication of technical books for many years.

JOHN WALTER YOUNG, second vice-president of the Chalmers & Williams Mining Machinery Company, died at Evanston, Ill., on January 14 of heart disease. He was born in Brooklyn, N. Y., in 1855 and received his technical training at the Brooklyn Polytechnic Institute. In 1890 he became vice-president of the Fraser & Chalmers Company, of Chicago. On the formation of the Allis-Chalmers Company in 1900 he became its European manager, retaining this position until 1907.

CHARLES I. YOUNG, regarded by his associates in the Westinghouse Electric & Manufacturing Company as the dean of the sales educational work, passed peacefully away on January 6. Mr. Young had been failing in health for a year past, and in November he sought to improve his condition by going to a sanitarium for treatment. Due to an electric shock of 2,500 volts, received in 1888, he was for three years following that accident incapacitated for work. During this same period he suffered for a time with malarial fever. In 1891 he returned to Pittsburgh to continue his services with the Westinghouse Company and, while physically he was weak and partially dependent upon the help of another, his keen insight into human nature and his knowledge of the electrical business fitted him splendidly for work in the sales

Charles I. Young.

department as an advisory engineer, first in the Philadelphia Office, later in the export department, and finally at East Pittsburgh. With the inauguration of a commercial training department in the sales organization of the company, a few years ago, he was made the instructor. It has appeared to his many friends that in this work he realized to the fullest extent his ambitions to serve best the interests to which he had been attached for so long. His pleasing personality, coupled with a mind keen to every point of human nature, made him a magnetic force wherever he mingled with men, and it is pleasing to record that every class which came to Pittsburgh, before breaking up to return to active work in the field, left a testimonial of one kind or another expressive of the high esteem in which he was held. Mr. Young was a graduate of Princeton in the class of 1883. He was then employed by the Edison Machine Works at New York, testing generators during 1884 and 1885; later, he was superintendent of the Edison Illuminating Company. He became attached to the Westinghouse interests in the fall of 1886.

PROPOSALS.

AUTOMATIC SIGNAL MATERIAL FOR THE RELOCATION OF THE PANAMA RAILROAD.—Sealed proposals will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until 10:30 a. m., January 25, for the above mentioned articles.

CAPSTANS.—Sealed proposals indorsed "Proposals for Electric Capstans" will be received at the bureau of yards and docks, Navy Department, Washington, D. C., until 11 a. m., January 27, for two electrically driven capstans for the navy yard, Norfolk, Va. Specifications can be obtained on application to the bureau or to the commandant of the navy yard.

ELECTRICAL SUPPLIES.—Proposals will be received until January 23 by the Bureau of Supplies and Accounts, Washington, D. C., for electrical fuses for Mare Island Navy Yard. Bids will be received until January 30 for the following items:

Article.	Quantity.	No.
Machine, blueprint, electric	1	4,247
Receivers and transmitters	Misc.	4,254
Sets, generating, 300 K. W.	4	4,249
Sets, wireless telegraph...	25	4,250

Bids will be received until January 30 by the paymaster general of the navy for soft copper wire for Mare Island.

POST OFFICE AT BONHAM, TEX.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February, 15, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring, and lighting fixtures) of a one-story and basement nonfireproof building, of approximately 4,235 square feet ground area, for the post office at Bonham, Tex. Drawings and specification may be obtained from the custodian of the site or the office of the Supervising Architect.

NEW PUBLICATIONS.

TERRESTRIAL MAGNETISM.—A publication on the distribution of the magnetic declination of the United States for January 1, 1910, has been issued by the Department of Commerce and Labor. A number of charts and tables have been included.

SECURITIES OF ELECTRIC LIGHTING CORPORATIONS. — A booklet under this title has been prepared by Robert T. Lozier and published by Kountze Brothers, Bankers, of New York. The history of the central station is taken up briefly and the value of securities in this line touched upon.

DATES AHEAD.

Peoria Electric Show. Peoria, Ill., January 22-27.

Northwestern Cedarmen's Association. Minneapolis, Minn., January 23-24.

Western Association of Electrical Inspectors, Milwaukee, Wis., January 23-25.

Ohio Engineering Society. Cleveland, O., January 24-26.

Indiana Engineering Society. Annual meeting, Denison Hotel, Indianapolis, January 25-27.

Illinois Electrical Contractors' Association. Chicago, Ill., January 29.

National Independent Telephone Association. Annual convention, Chicago, Ill., February 7-9.

Wisconsin State Telephone Association. Annual meeting, Madison, Wis., February 14-15.

National Electrical Supply Jobbers' Association. Hollenden Hotel, Cleveland, O., February 13-15.

New England Section of the National Electric Light Association. Annual meeting, Hotel Kimball, Springfield, Mass., March 14-15.

Northwestern Electric Show. Minneapolis, Minn., March 16-23.

National Railway Appliances Association, Inc., Chicago, Ill., March 18-23.

American Railway Engineering and Maintenance of Way Association. Chicago, Ill., March 19-21.

Minnesota Electrical Association. Minneapolis, Minn., March 20-22.

National Electric Light Association. Annual convention, Seattle, Wash., June 10-14.

American Institute of Electrical Engineers. Annual convention, Boston, Mass., June 25-28.

National Electrical Contractors' Association. Annual meeting, Denver, Colo., July 17-20.

The 1912 Boston Electric Show. Mechanics Building, Boston, Mass., September 28-October 26.

With the Electrical Manufacturers

Cross Brothers Iron Works, Eugene, Ore., has been awarded the contract for 98 iron posts for a cluster street-lighting system in the business district of Eugene.

Union Metal Manufacturing Company, Canton, O., has secured the order for the ornamental posts to be used in the new lighting system to be installed in Utica, N. Y.

Busch—Sulzer Brothers—Diesel Engine Company, St. Louis, Mo., has issued Bulletin 102 on Diesel oil engines for brewery and ice-plant service. This is a reprint of a paper read before the recent Internatonal Brewers' Congress in Chicago.

The Blackburn Specialty Company, of Cleveland, Ohio, has removed its quarters to 1120 Prospect Avenue, S. E. The company now has better facilities for prompt delivery of its Blackburn ground clamps, B-C bench clamps and Auto lock switches.

The Emerson Electric Manufacturing Company, 2024 Washington Avenue, St. Louis, Mo., devotes the January issue of the Emerson Monthly chiefly to a summary of its 1912 line of Emerson and Trojan electric fans which from many standpoints are more attractive than ever.

The Staunton Dielectrite Rubber Company, of Muskegon, Mich., has changed its name to **Vulcanized Products Company,** thus avoiding a slight confusion in names. Its insulating material formerly known as Dielectrite has been renamed Gohmack. This material is now carried in stock in sheets from 1/16 to 1½ inches in thickness.

Henry D. Sears, 131 State street, Boston, Mass., general sales agent of the Weber universal lamp sockets, has issued a new price list of interchangeable sockets for fixture, pendant and wall use and of the key, keyless or pull-drain types. The special feature of these sockets is that all the shells fit all the caps.

The Kellogg Switchboard & Supply Company, of Chicago, Ill., has published two bulletins of much interest. One is devoted to its extensive line of telephone apparatus, including instruments, switchboards, exchange and substation equipment; this is all copiously illustrated. Another bulletin deals with line-construction materials, tools and miscellaneous telephone supplies.

The Trumbull Electric Manufacturing Company, of Plainville, Conn., has issued the January (fifth anuiversary) number of its monthly house organ "Trumbull Cheer." This number is even more choice than usual. Along with its good humor and cheer is a goodly lot of that rather rare "common sense." A number of new porcelain specialties are featured and the growth of the Trumbull factory strikingly shown.

The F. W. Wakefield Brass Company, of Vermilion, Ohio, has sent out a unique folder and reply card call-in attention to the utility convenience and low cost of Wakefield adapters. The folder is sealed by means of a sample adapter. These little devices permit the ready changing of forty-five degree or other oblique fixture arms to the direct downward position which is now recognized as being the most effective and appropriate arrangement for all lighting fixtures.

The Westinghouse Electric & Manufacturing Company has just closed a negotiation with the Philadelphia Rapid Transit Company for 300 complete railroad equipments which are to be used in the new "Nearside" cars. The International Railways Company of Buffalo has also ordered complete equipment for 100 of these new-type "Nearside" cars which are to operate within the next few months.

Record of Electrical Patents.

Issued by the United States Patent Office, January 9, 1912

1,013,859. Filament Support. W. R. Burrows, assignor to General Electric Co. A pedestal mounted on the lamp stem supports one or more spiral springs to which are laterally attached hooked arms that carry loops of the metal filament.

1,013,865. Telephone System. W. W. Dean, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Includes a special arrangement of two relays for controlling a supervisory lamp.

1,013,901. Towing System for Canals. E. Schildhauer, Culebra, Canal Zone. A traveling winch has a main electric motor for driving the winch slowly and an auxiliary motor for driving it fast.

1,013,904. Electric Indicator System. S. R. Stone, New York, N. Y. A combined fire-alarm and call-bell system in which the same circuits serve automatically for fire alarms and can also be operated voluntarily by operators for call-bell use.

1,013,914. Attaching Filaments to Leading-in Wires. W. R. Whitney, assignor to General Electric Co. The leading-in wire is wound spirally about the filament end and pinched tightly to it.

1,013,915. Metal-Filament Lamp. W. R. Whitney, assignor to General Electric Co. Each filament loop has an anchorage wire with a weakened portion to permit it to bend when a dangerous tension is applied to the filament.

1,013,925. Driving Mechanism for Axle-Driven Dynamos. W. L. Bliss, assignor to United States Light & Heating Co., New York, N. Y. A clutch with a set of tangential helical springs between crossed arms.

1,031,958. Shaping and Mounting Filaments. K. Schröter, assignor to General Electric Co. Consists in bending a tungsten wire back and forth on a shaper and pinching the ends with a pliers.

1,013,959. Mechanism for Charging Storage Batteries. J. B. Schug, Detroit, Mich. Includes an electromagnet that operates a circuit-closer and a circuit-breaker.

1,013,962. Filament Connection. F. Skaupy, assignor to General Electric Co. A terminal for a filament consists of a V-shaped sheet-metal strip to the extremities of which the filament is secured.

1,013,965. Filament-Supports for Incandescent Lamps. C. P. Steinmetz, assignor to General Electric Co. A metallic filament arranged in a number of loops has a coiled spring associated with each loop.

1,013,972. Junction Box. W. S. Timmis, New York, N. Y. A tubular body with a tube-receiving opening near one end, caps on each end and an insulating bushing in one cap.

1,013,990. Electric Switch. J. E. Du Val, assignor of one-half to E. A. Lee, Bowie, Tex. To one of two line-wire sections is secured a case within which is a transverse pin. The other section terminates in a flat bar with a hook at its end adapted to enter the case and engage the pin, springs holding the two parts in contact.

1,014,001. Alternating-Current Motor. H. F. Hitner, assignor to Burke Electric Co. Starts as a repulsion motor until a certain speed is attained, whereupon centrifugal force changes the connections to those of an induction motor.

1,014,002. Apparatus for Wireless Signaling. J. L. Hogan, Jr., assignor to National Electric Signaling Co., Pittsburgh, Pa. A tuning instrument for connecting two resonant circuits has a variable tuning element common to both circuits.

1,014,025. Clip for Miners' Lamps. G. I. Rawson and L. B. Shultz, assignors to Pilley Packing & Flue Brush Manufacturing Co., St. Louis, Mo. An insulating cap carries two contacts to which a flexible cable connects.

1,014,049. Art of Electrical Distribution. R. D. Cutler and M. F. Owens, assignors to Hartford Electric Light Co., Hartford, Conn. An automatic diverter which maintains the total load constant among a number of current-consuming devices, although their individual consumption varies.

1,013,990.—Line Switch.

1,014,098.—Inclosed Fuse.

1,014,061. Process of Recovering Copper from Its Ores. H. K. Hess. assignor to American Copper Extracting & Refining Co. The ore is treated with sulphuric and chromic acids and the solution formed is electrolyzed.

1,014,071. Current-Collector for Electric Cranes. F. C. Lemon, Milwaukee, Wis. A post supports a number of current-collectors, each having a transverse arm and grooved contact piece.

1,014,098. Thermal Cutout. J. Sachs, assignor to Sachs Co., Hartford, Conn. An inclosed fuse having a cellular jacket surrounding and integral with the fuse element so as to form a reload removable from the casing.

1,014,108. Electric Coupling. P. C. Wild, Rochester, N. Y. Consists of two co-operating members, one being a tubular barrel into which fits a plug.

1,014,125. Harmonic Ringer. E. B. Craft, assignor to Western Electric Co. A telephone bell with a pair of polarized magnet coils and an armature oscillating at their end.

1,014,146. Electric Battery. H. Halsey, assignor to Halsey Electric Generator Co. Consists of a number of compartments each including electrodes forming a couple.

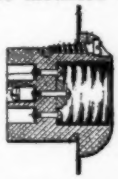
1,014,151. Apparatus for the Electrical Treatment of Vapors or Gases. W. T. Hoofnagle, Glen Ridge, N. J. Includes a chamber in which rarified gas is subjected to electric action.

1,014,161. Electrical Heater. C. P. Madsen, assignor to Pelouze Electric Heater Co., Chicago, Ill. A toaster with a hotizontal resistance element supported by tension bars; below the heating element is a heat reflector and above it a food grid.

1,014,169. Electric-Lamp Socket. Mortimer Norden, New York, N. Y. A sign receptacle has an enlarged head fitting into a plate and joined thereto by a screw.

1,014,199. Refractory Body and Process of Making the Same. E. G. Acheson, Stamford, Ontario, Canada. A compound of silicon and carbon, more tough than carborundum, is made in an electric furnace.

1,014,207. Spark-Plug Tester. A. de Clairmont, Toledo, O. Consists of a translucent tube mounted on a handle, the ends of the tube having extensions that engage the plug terminals and are connected to adjacent terminals in the tube.



1,014,169.—Sign-Lamp Receptacle.

1,014,208. Railway Signaling Apparatus. William J. Cook, assignor to Cook Railway Signal Co., Denver, Colo. A block-signal system in which the semaphore arms are electromagnetically operated.

1,014,210. Alternating-Current Electric Motor. W. N. Dickinson, Jr., assignor to Otis Elevator Co., Jersey City, N. J. An elevator motor has a brake that is electromagnetically operated.

1,014,216. Brake-Magnet Protective Device. E. L. Gale, Sr., assignor to Otis Elevator Co. An alternating-current brake with movable magnetic cores has an electric signal to indicate when the cores are released too far.

1,014,217. Power-Table for Kitchen Utensils. J. H. Goehst and R. G. Carpenter, assignors to Federal Electric Co., Chicago, Ill. Has a power shaft driven by an electric motor and adapted for connection to any one of several kitchen utensils.

1,014,220. Monotelephone Relay. P. Heina, assignor to Ste. des Telegraphes Multiplex, (System E. Mer-

cadier), Paris, France. Consists of a plate near the center of which is an alloyed knife connected to a direct-current relay and printing apparatus.

1,014,234. Mechanical Reversing and Accelerating Switch. D. Larson, assignor to Otis Elevator Co. An automatic motor controller for accelerating the motor in either direction and for insuring that the current is cut off at the moment of reversal.

1,014,253. Commutator. M. Pfatischer, Bayonne, N. J. Filed July 10, 1907. A composite commutator bar made by welding two thin supporting plates to the bottom of the bar, the plates being held apart by a spacer and engaging the commutator clamps.

1,014,257. Vibration-Absorber for Alternating-Current-Magnet Armatures. C. L. Rosenquist, assignor to Otis Elevator Co. An electric vibration transmitter connects a weight to the magnet armature.

1,014,268. Combined Transmitter and Receiver. W. B. Thompson, assignor of one-half to A. E. Kenison, North Conway, N. H. Relates to the construction of the granular microphone transmitter.

1,014,277. Electric Time Switch. W. Wood, Denver, Colo. Clockwork is arranged to open and close a lighting circuit intermittently.

1,014,287. Incandescent-Electric-Lamp Leak-Tester. B. G. Erskine, assignor to Novelty Incandescent Lamp Co., Emporium, Pa. A group of manometers, each having an individual flexible tube, is arranged for connection to the lamps to be tested.

1,014,300. Multithrow Switch. Gerald W. Hart, assignor to Hart Manufacturing Co., Hartford, Conn. A switch movable toward and from the base is controlled by a solenoid and spring.

1,014,354. System of Electrical Distribution. J. L. Woodbridge, Philadelphia, Pa. A storage battery is arranged for interconnecting and equalizing the load on an alternating-current and a direct-current circuit.

1,014,355. Electrical System of Distribution. J. L. Woodbridge, Philadelphia, Pa. Across a variable-speed dynamo is connected a Wheatstone bridge with counter-electromotive-force cells and resistances with high temperature coefficients in the alternate arms, the dynamo field being connected to the opposite corners of the bridge.

1,014,373. System of Alternating-Current Regulation. J. Bijur, assignor to Electric Storage Battery Co., Philadelphia, Pa. A main alternator and work circuit has associated with it an auxiliary alternator and heavy flywheel, also means for maintaining the machines in synchronism.

1,014,395. System of Electrical Distribution. R. C. Hull, Philadelphia, Pa. A dynamo has two short-circuited brushes between its main brushes; its field is connected to two opposite corners of a Wheatstone bridge having resistance arms of different temperature coefficient, the two corners being connected to the work circuit.

1,014,437. Electric Heater. C. O. Bastian, London, Eng. Includes a heating element made of a resistance conductor inclosed in a quartz tube.

1,014,443. Mechanical Movement and Electric-Light Socket. T. A. C. Both, assignor to Ida S. Rosenheim, New York, N. Y. By means of different sets of ratchet teeth, the driven part is always turned in the same direction regardless of the direction of the driver.

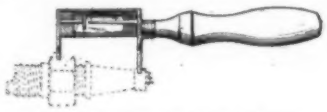
1,014,455. Magnetically Controlled Switching Apparatus. S. B. Condit, Jr., Brookline, Mass. A disconnecting switch has a latch that prevents opening of the switch as long as the main current is on.

1,014,461. Electric Gas-Lighter. H. D. Grinnell, Pittsfield, Mass. At the base of the burner are binding posts into the hooks of which are secured coiled springs connecting to spark points at the tip.

1,014,466. Rectifier. R. A. Hamann, Omaha, Neb. Includes a variable condenser and a polarized relay between whose cores an armature oscillates, establishing alternate contact to two direct-current circuits.

1,014,488. Cable Duplex Repeating System. I. Kitsee, assignor of one-half to William J. Latta, Philadelphia, Pa. Each line has a transformer whose primary is connected to its line and whose secondary transmits impulses of alternate polarity to the other line.

1,014,515. Electric Ticket-Selling Device and Change-Maker. L. L. Pim



1,014,207.—Spark-plug Tester.

and J. J. Christmann, Denver, Colo. A lever governs a series of electromagnetic stops in a metallic chute.

1,014,537. Electric Appliance. M. Thulin, Ephraim, Utah. A medical electrode has liquid-receiving longitudinal tubes.

1,014,556. Trackless Trolley. C. A. Ahl, Salem, N. J. A contact block with a depending shank runs upon two parallel trolley wires.

1,014,560. Process of Electroplating Aluminum and Its Alloys. E. Becker and O. Becker, Iserlohn, Germany. The articles are repeatedly immersed in a boiling solution of ammonia and potassium cyanide, cooled in a tartar solution and then directly electroplated.

1,014,569. Trolley Hanger. R. O. Couch, Charleston, W. Va. A shell incloses an insulating block and a bolt to which is secured a ring that holds the trolley-wire clamping jaws.

1,014,588. Electrical Signaling Device. E. A. Fitzgerald, Highwood, Ill. Depression of a track rail closes an electric signal circuit.

1,014,600. Electrical Relay. E. E. Kleinschmidt, New York, N. Y. Includes an interlocking contact-member adapted to swing and then remain stationary in the position swung to.

1,014,604. Integrating Mechanism. E. H. Messiter, assignor to Electric Weighing Co., New York, N. Y. A plunger successively displaces a mercury column, thus closing a series of contacts in a recording electric circuit.

1,014,622. Magneto. J. W. Dinkins and F. B. Hays, assignors of part to W. L. Taylor, Indianapolis, Ind. Includes means for applying a torque to the armature in starting.

1,014,625. Electric Controller. A. C. Eastwood, assignor to Electric Controller & Manufacturing Co., Cleveland, O. A series of motor-controlling switches is electromagnetically closed in a predetermined order.

Reissues.

13,352. Vacuum Cleaner. C. A. Dillon, assignor to United Electric Co., Canton, O. Original No. 1,005,005, dated Oct. 3, 1911. Has an electric motor driving a suction fan.

13,353. Electric Lamp Socket. H. Hubbell, assignor to Harvey Hubbell, Inc., Bridgeport, Conn. Original No. 943,078, dated Dec. 14, 1909. Has a two-part cap arranged to prevent relative rotation.

13,354. Dynamo-Electric Machine. L. J. Hunt, Sandycroft, England. Original No. 926,192, dated June 29, 1909. An induction motor with terminals for different numbers of poles in both stator and rotor.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired January 15, 1912.

532,441. System of Power Transmission. Charles S. Bradley, Avon, N. Y.

532,448. Conduit-Railway Trolley. William T. Dulany, Jr., New York, N. Y.

532,449. Conduit Electric Railway. William T. Dulany, Jr., New York, N. Y.

532,475. Brake for Electric Motors. William H. Morgan, Alliance, O.

532,514. Electric Elevator and Motor Controller. Robert Wilson, Louisville, Ky.

532,531. Electric-Arc Lamp. Arthur Chester and John J. Rathbone, London, England.

532,537. Automatic Circuit-Breaker. Harry P. Davis, Pittsburgh, Pa.

532,538. Controller for Electric Cars. Harry P. Davis, Pittsburgh, Pa.

532,549. Alternating-Current Motor. Ludwig Gutman, Pittsburgh, Pa.

532,559, 532,560 and 532,561. Galvanometer. Adrian H. Hoyt, Penacook, N. H.

532,576. Closed-Conduit Electric Railway. George W. McClintock, Wollaston, and Daniel J. McLane, Quincy, Mass.

532,588. Contact Device for Electrical Appliances. Friedrich W. Schindler-Jenny, Kennelbach, Austria-Hungary.

532,590. Closed-Conduit Electric Railway. John Scheff, New York, N. Y.

532,593. Converter System for Electric Railways. Charles F. Scott, Pittsburgh, Pa.

432,594. Non-Arcing Switch. Charles F. Scott and Harry P. Davis, Pittsburgh, Pa.

532,605. Annunciator for Telephonic Circuits. Theodore Spencer, Cambridge, Mass.

532,633. Railway Block-Signal. William Berrigan and William H. McClure, Elmira, N. Y.